547

PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

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ABSTRACTS 1555–1824

Vol. 46 JULY, 1943 No. 547

SPECIAL PLANT FOR APPLICATIONS of VACUUM TECHNIQUE

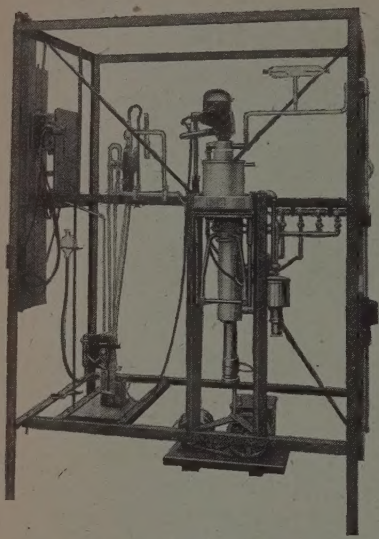

Illustration shows an apparatus installed in an experimental laboratory for determining the oxygen content in steel by the vacuum fusion method.

(1) Determination of gas content in metals by vacuum fusion methods.

In peace time we were able to design and build all the plant for this process. Because of heavy demands for standard equipment we cannot at present make the complete plant but we do supply all the necessary high vacuum apparatus.

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MATHEMATICS

1555 51 : 581

Outline of a new mathematical approach to general biology. I. RASHEVSKY, N. *Bull. Math. Biophys*, 5, *pp.* 33–47, *March*, 1943.—Deals with the theory of organic form. By introducing a formal principle, it is possible to develop a mathematical theory of shapes of organisms, which covers both animals and plants.

See Abstr. 1560 513.621 : 517.93 = 60

1556 513.761.4

Generalized homology groups. MAYER, W., AND CAMPBELL, A. D. *Rev. Univ. Nac. Tucumán*, 3, *pp.* 155–194, *June*, 1942.—A proof is given of the theorem concerning the invariance of some new homology groups with resp. to subdivisions of simplicial complexes.

1557 513.77

Conformal geometry of unitary space. COBURN, N. *Rev. Univ. Nac. Tucumán*, 3, *pp.* 125–140, *June*, 1942.—Concerns the conformal geometry of unitary space of n dimensions, the determination of unitary affinors which transform as affinors and are invariant under conformal transformations of the fundamental tensor. Necessary and sufficient conditions for the existence of $k \leqslant n^2$ conformal fundamental tensors are discussed.

1558 517.544

The conformal mapping of multiply connected domains on the basis of Plateau's problem. MANEL, B. *Rev. Univ. Nac. Tucumán*, 3, *pp.* 141–149, *June*, 1942.—Concerns mapping theorems in which the normal domains are simple types of slit domains in the plane.

1559 517.93

Differential equations of the type $y^{IV} = Ay'''^2 + By''' + C$. KASNER, E. *Rev. Univ. Nac. Tucumán*, 3, *pp.* 7–12, *June*, 1942.—Some problems of geometry (osculating conics), of the calculus of variations and of dynamics (trajectories), which revert to the equation stated, are discussed.

1560 517.93 : 513.621 = 60

Contribution to the geometric study of the differential equation $y''' = F(x, y, y') + G(x, y, y')y'' + H(x, y, y')y'^2$. TERRACINI, A. *Rev. Univ. Nac. Tucumán*, 3, *pp.* 195–234, *June*, 1942.—When $F = 0$ [see Abstr. 2761 (1942)] the equation is most conveniently represented interpreting x, y as projective non-homogeneous point co-ordinates in a plane; when $F \neq 0$ this interpretation is possible, but not necessary, since it has a meaning to speak of a system ∞^3 of lines repr. by the complete equation in any parametric interpretation on the surface considered. The author studies the systems in the plane and on a surface in 3-dimensional projective space.

1561 517.941.91 : 621.3.014 = 690

On the principle of superposition in the theory of the linear electric circuit. GROSS, B. *Rev. Univ. Nac. Tucumán*, 3, *pp.* 121–123, *June*, 1942.—[Abstr. 1450 B (1943)].

1562 518.3 : 536.421.4

Solidification-point nomograph for fatty acids. DAVIS, D. S. *Industr. Engng Chem.*, 35, *pp.* 105–106, *Jan.*, 1943.

1563 518.4

The determination of turning-values by means of logarithmic graphs. SILVER, R. S. *J. Sci. Instrum.*, 20, *pp.* 76–77, *May*, 1943.

See Abstr. 1815 518.5 : 550.831

1564 518.5 : 621.317.32 : 621.396.671

An electromechanical calculator for directional-antenna patterns. SMITH, C. E., AND GOVE, E. L. *Trans. Amer. Inst. Elect. Engrs*, 62, *pp.* 78–83, *Feb.*, 1943.—[Abstr. 1553 B (1943)].

1565 519.214.9

Note on partial sums of the exponential series. KAC, M. *Rev. Univ. Nac. Tucumán*, 3, *pp.* 151–153, *June*, 1942.

See Abstr. 1803 519.4 : 535.544 : 548

1566 519.5

Tactical configurations and the method of symmetric differences. AYYANGAR, A. A. K. *Curr. Sci.*, 11, *pp.* 459–460, *Dec.*, 1942.

ASTRONOMY. GEODESY

See Abstr. 1820 523.4 : 551.510.41

1567 523.67

Physical theory of comets in the light of spectroscopic data. BOBROVNIKOFF, N. T. *Rev. Mod. Phys.*, 14, *pp.* 164–178, *April–July*, 1942.—The repulsive forces acting on particles ejected from the nuclei of diff. comets, as determined from the curvature of their tails, vary from almost zero to several thousand times gravitation. These variations, and large differences betw. the same comet at diff. heliocentric distances, find no explanation if CO+ and N_2^+ are the main constituents, as spectroscopic evidence suggests. Variations in the continuous and band spectra of comets are reviewed with inconclusive results. The nature of the matter ejected in jets and fans varies from comet to comet and even in the same comet at diff. times. It is concluded that spectroscopic evidence is as yet too fragmentary for effective use in cometary theory, and a programme of future observational procedure is outlined. A full bibliography from 1864 to 1937 is given. A. HU.

1568 523.67

Intensity measurements on emission bands in cometary spectra. MCKELLAR, A. *Rev. Mod. Phys.*, 14, *pp.* 179–189, *April–July*, 1942.—Quantitative intensity measurements made on bands due to CN, CH and C_2 in the spectra of Comets 1939*d* and 1940*c* are related to modern theories of the excitation of cometary bands. The results confirm that the peculiar CN band structure is an effect of the abnormally low population in certain upper rotational levels due to strong absorption features in the spectrum of the exciting sunlight. A brief discussion emphasizes the relationship betw. the structure of cometary bands and the radial vel. of the comet rel. to the Sun. A. HU.

1569 523.67

Molecular bands in cometary spectra. Identifications. SWINGS, P. *Rev. Mod. Phys.*, 14, *pp.* 190–194, *April–July*, 1942.—Possible emitters of unidentified bands in the blue, violet and ultra-violet spectra of

comets are discussed, on the assumption that the mechanism of excitation is resonance fluorescence. The molecule responsible for the λ4 050 group is perhaps NH^+, though there are objections to this identification, or a polyatomic molecule such as CH_2 or NH_2^+ resulting from the photodissociation of meteoric gas. Astronomical evidence is given supporting the view that it is CH_2. Spectroscopic observations, in the lab. on certain little-known molecules and in the observatory on the cometary bands in the red and near infra-red, are badly needed.

A. HU.

1570 523.67

Evidence for the presence of CH_2 molecules in comets. HERZBERG, G. *Rev. Mod. Phys.*, 14, *pp.* 195–197, *April–July*, 1942.—The structure of the λ4 050 group in cometary spectra is shown to conform best with that of a perpendicular band of a polyatomic symmetric-top molecule, the m. of i. about the top axis being $0{\cdot}35 \times 10^{-40}$ gm.cm.^{2} Such a small value is possible only in a slightly bent XH_2 molecule where X = C, N or O. Reasons are given for believing that the emitter is CH_2. A footnote announces that the band has now been obtained in the laboratory in a discharge through rapidly streaming CH_4 under conditions which support the identification with CH_2.

A. HU.

1571 523.77

Resolution of the telluric bands ω_1 and ω_2. ADEL, A. *Astrophys. J.*, 97, *pp.* 190–193, *March*, 1943.—The CO_2 bands ω_1 and ω_2, which appear in the solar spectrum at 20 061 Å and 20 568 Å, respectively, have been resolved into their rotational structures.

See Abstr. 1574 523.841.11 : 523.872

See Abstr. 1575 523.852 : 523.872

1572 523.872

BD +14°3887, a peculiar Be star showing emission lines of Na I, [Fe III], and He I: with a note on the spectrum of CD −27°11944. SWENSSON, J. W. *Astrophys. J.*, 97, *pp.* 226–233, *March*, 1943.—The peculiar Be star, BD + 14°3887, shows emission lines of H, He I, Fe II, [Fe II], [Fe III], Cr II, Mg I, Mg II and Na I. The combination of bright [Fe III], He I and Na I lines is unusual. The abs. magnitude of the star, the mechanisms of excitation of the emission lines, and the properties of the shell are discussed. New lines are found in the P Cygni star, CD − 27°11944.

1573 523.872

The spectrum of *v* Sagittarii in the visual region. GREENSTEIN, J. L. *Astrophys. J.*, 97, *pp.* 252–254, *March*, 1943.—The visual region of the spectrum of *v* Sgr is marked by the strength of lines of N and Ne. Estimates of the abundances of the lighter elements show high abundance of Ne and an abnormal abundance of N with respect to O.

1574 523.872 : 523.841.11

The spectrum of Nova Cygni 1942. SANFORD, R. F. *Astrophys. J.*, 97, *pp.* 130–134, *March*, 1943.—Changes in the light and spectrum of Nova Cygni 1942 from Sept. 15 to Dec. 17, 1942, are outlined.

1575 523.872 : 523.852

The spectrum of the nebulosity near Kepler's nova of 1604. MINKOWSKI, R. *Astrophys. J.*, 97, *pp.* 128–129, *March*, 1943.—The spectrum of the nebulosity near Kepler's nova of 1604 is similar to that of the filaments of the Crab nebula, particularly in the low intensity of Hα rel. to the [N II] lines. The intensity of [O III] λ5 007 is less than in the Crab nebula; this suggests heavy space reddening corresp. to a colour excess of 2·1 mag. The results support the opinion that the nebulosity is actually a remnant of Kepler's nova and that this object was a supernova.

1576 523.873

The structure of interstellar *H* and *K* lines in fifty stars. ADAMS, W. S. *Astrophys. J.*, 97, *pp.* 105–111, *March*, 1943.—The structure of the interstellar *H* and *K* lines of Ca II appearing in the spectra of 50 stars of early type has been studied in the second order of the grating spectrograph at the Coudé focus of the 100 in. telescope. The camera has a focal length of 114 in. and gives a linear scale of 2·9 Å/mm. More than 80% of the stars show complex lines consisting of 2 to 5 components. Stars in various regions show differences in complexity. The intensities of the components have been estimated. Measurements of their radial velocities provide a means of distinguishing individual interstellar clouds in various portions of the sky. Many of the clouds are found to extend over great areas. The narrowness of the components affords evidence for the discrete character of the clouds and the absence of turbulence. The spectra have been examined for the additional narrow interstellar lines discovered and identified during recent years, and their intensities have been estimated.

1577 523.873

The spectrum of HD 192954. BROYLES, A. A. *Astrophys. J.*, 97, *pp.* 234–251, *March*, 1943.—The star HD 192954 was given a spectral classification B9 in the Draper Catalogue and A2e by Merrill. This raises the question of the presence of a shell. Since the contours of the H lines show very narrow and deep central cores with broad shallow wings to each side, it is evident that part of the absorption takes place in a dense layer corresp. to a star of the main sequence and part in a layer of very low pressure. The weakening of Mg II and of Si II lines indicates that dilution takes place in the outer layer and that the layer is a shell of the type of Pleione. The presence of He, together with other facts, indicates that the star itself is of type B9n. The rad. vel. is + 15 km./sec. A list of lines measured in the spectrum of HD 192954 from λ3 321 to λ5 479 is given.

1578 523.875

A study of emission-line intensities in some bright northern Wolf–Rayet stars. ALLER, L. H. *Astrophys. J.*, 97, *pp.* 135–165, *March*, 1943.—From a study of emission-line intensities excitation temperatures of the atmospheric envelopes are estimated. These temperatures turn out to be very high and depend upon the ionization potential of the ion employed. The emission lines in the Wolf–Rayet stars probably do not arise from the primary mechanism, i.e. photoionization and subsequent recapture of electrons, but rather from the absorption of h.f. radiation emerging from the lower layers. On the basis of certain plausible assumptions an attempt is made to find the chemical composition of the atmospheric layers. The chem. composition of the

Wolf–Rayet stars seems to be more closely related to that of the supernovae than to the envelopes of ordinary novae, which appear to have roughly the same composition as the planetary nebulae and normal stars. The electron densities in the radiating layers of a Wolf–Rayet star appear to be of the order of 10^{11}–10^{12} electrons/cm.^{3} The background spectrum of the star is sufficiently intense to blot out any forbidden lines that may appear.

1579 525.622

Notes on earth tides. LAMBERT, W. D. *Geophysics*, 8, *pp.* 51–56, *Jan.*, 1943.—Attention is called to the problem of the zero point for earth tides; this involves the so-called permanent tide or increase in the flattening of the earth. A suggestion is made for the use of existing tabulations for computing theoretical earth tides. Attention is also called to the effect of the varying distance of the tide-producing body and to the secondary effects of the oceanic tides.

PHYSICS: GENERAL

See Abstr. 1802 53 : 548

1580 53 : 679.5

Nylon yarn and its possibilities. LOASBY, G. *J. Text. Inst. Manchr*, 34, *pp.* P45–P63, *March*, 1943.—Draws attention to the salient features of nylon, the properties it has in common with silk and rayons, and properties essentially unique. Mech., thermal and elect. properties of nylon yarn are dealt with, and also its moisture affinity, refr. index, degradation, fluidity and viscosity, insect and bacterial action, recovery from strain, elasticity and dyeing properties, in which latter it resembles both wool and acetate rayon. The potentialities and possibilities of nylon yarn are shown to be enormous, and the fibre is expected to find an application in fabrics where strength combined with lightness and low moisture content or quick drying are desired. With wool, it forms mixtures which can be easily dyed, and nylon staple makes up well on both the woollen and worsted systems. Nylon can also be made into fibres on the spun-silk principle with excellent results. H. H. HO.

See Abstr. 1702 530 12 : 535.13 : 538.3

See Abstr. 1703 530.12 : 539.185 : 537.217 : 538.3

See Abstr. 1704 531 : 538.551

1581 531.18 : 535.312 : 531.66 = 60

Impact of variable masses and the law of reflection for a particle. WÜRSCHMIDT, J. *Rev. Univ. Nac. Tucumán*, 3, *pp.* 79–110, *June*, 1942.—Considering the collision of 2 particles, the masses of which depend on the velocity, the author deduces the law of reflection of light from a mirror moving in a direction at an angle χ to the normal, and that of the rebound of a mass from a moving wall. It is confirmed that relativistic dynamics is the dynamics of a mass dep. on velocity.

1582 531.19

"Condensation" in Fermi–Dirac statistics. KOTHARI, D. S., AND NATH, B. *Nature, Lond.*, 151, *p.* 420, *April* 10, 1943.

1583 531.19 : 541.123.2

Statistical mechanics of binary mixtures. KOTTLER, F. *J. Chem. Phys.*, 11, *pp.* 153–155, *March*, 1943.—[See Abstr. 2269 (1942)].

1584 531.21.08

The measurement of dynamical magnitudes. CAMPBELL, N. *Proc. Phys. Soc., Lond.*, 55, *pp.* 204–210, *May*, 1943.—A discussion is given of the question on what experiments the Newtonian theory of dynamics is most suitably based, and in particular whether quantity of matter, mass and force can be measured independently of that theory.

1585 531.224.4

Perforated cover plates for steel columns: compressive properties of plates having circular perforations and a width-to-thickness ratio of 53. STANG, A. H., AND GREENSPAN, M. *J. Res. Nat. Bur. Stand., Wash.*, 30, *pp.* 177–202, *March, and pp.* 411–425, *May*, 1943.—[See Abstr. 1189 (1943)]. Tests were made to determine the mech. properties of perforated cover plates as a substitute for lattice bars or batten plates in built-up box-type columns. Each test column was built up from one perforated plate and either 2 or 4 angles. Columns with unperforated plates were used as controls. The perforated plates contributed to the strength and to the stiffness of the columns, and the factor of stress concentration, due to the presence of the perforations, varied from 2·5 to 3·4 based on the gross area.

1586 531.262

Two-dimensional boundary-value problems in potential theory. SOKOLNIKOFF, I. S., AND SPECHT, R. D. *J. Appl. Phys.*, 14, *pp.* 91–95, *Feb.*, 1943.—A solution of the problem of Dirichlet for a 2-dimensional region that can be mapped conformally on a circle is given by the formula of Schwarz. This formula is specialized to yield a complete solution of the torsion problem of St. Venant.

1587 531.55

Effects of the earth's rotation on the range and drift of a projectile. ROEVER, W. H. *Science*, 97, *pp.* 115–116, *Jan.* 29, 1943.—On the question: Does a projectile move farther when fired to the east than when fired to the west, the author finds that if the angle of elevation of the gun were 60°, the two distances would be the same. For angles below 60° the distance to the east would be the greater, and if the angle were greater than 60°, the reverse would take place. Use is made of formulae already published (Washington University Studies, 1940). Two proofs are given; in the second the drift is evaluated. G. E. A.

See Abstr. 1581 531.66 : 535.312 : 531.18 = 60

1588 531.71.082.5 : 535.338.3

The primary standard of wavelength. MEGGERS, W. F. *Rev. Mod. Phys.*, 14, *pp.* 59–63, *April–July*, 1942.

See Abstr. 1661 531.717 : 535.81.08

1589 531.72

Calculation of flat dimensions of sacks and bags when the volume to be contained is known. PARSONS, H. L. *J. Text. Inst. Manchr*, 34, *pp.* T1–T18, *March*, 1943.—Formulae are derived in an endeavour to relate flat dimensions of empty sacks and bags to the volumes they will hold when filled under varying conditions. The method of closure is identified into 2 types, (1) straight seaming at the top, which can be covered with good accuracy, and (2) central gathering and tying which is covered with moderate accuracy.

1590 531.752

An improved damping device for high-capacity balances. ANDREWS, H. L., OBERST, F. W., AND WILLIAMS, E. G. *Rev. Sci. Instrum.*, 14, *pp.* 22–23, *Jan.*, 1943.

1591 531.776

The use of stroboscopic patterns in the determination of speeds of rotation. MACINNES, D. A. *Rev. Sci. Instrum.*, 14, *pp.* 14–16, *Jan.*, 1943.—Patterns having as many as nine bands may be utilized. The patterns occur in a definite recurring sequence, according to a simple numerical relation. Most of the speeds intermediate to those at which patterns are stationary may be obtained by correcting for the precession or recession of the patterns.

1592 531.787

Barcroft–Warburg manometric apparatus. PERKINS, J. J. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 61–68, *Jan.* 15, 1943.—Experimental and theoretical research on microrespirometers is described, with particular ref. to the type quoted. Applications to biochemistry are given: sensitivity is such that measurements to much better than 0·0005 ml. are possible. Constructional details of the manometers etc., are included. Bibliography. E. H. W. B.

1593 532.12 : 534.2

Temperature and compressibilities of liquids. SURYAN, G. *Sci. and Cult.*, 8, *pp.* 311–312, *Jan.*, 1943.

1594 532.133 : 532.712 : 541.24

Molecular weights and intrinsic viscosities of polyisobutylenes. FLORY, P. J. *J. Amer. Chem. Soc.*, 65, *pp.* 372–382, *March*, 1943.—Exp. methods for fractionating polyisobutylene and for determining osmotic pressures are described. The ratio π/c of o.p. to conc. in the case of cyclohexane solutions of polyisobutylene varies non-linearly with conc. The slope of this relationship appears to be indep. of mol. wt. Reliable methods for extrapolating π/c to $c = 0$ are established, enabling the determination of abs. mol. wt. with satisfactory precision up to values of about 1 000 000. On the basis of data for carefully fractionated samples covering a 200-fold mol. wt. range, the intrinsic viscosity is found $\propto$ the 0·64 power of the mol. wt. This leads to the definition of a viscosity-average mol. wt. which is obtained when the relationship is applied to heterogeneous polymers. The viscosity-average is the weight-average mol. wt., and $>$ the number-average obtained by osmotic or cryoscopic methods. [See Abstr. 1508, 3145 (1942)].

See Abstr. 1677 532.133 : 536.7 : 539.133 : 537.226

1595 532.133 : 541.18.02

Viscometric estimation of particle dimensions. II. Micellar changes involved in the heat-bodying of tung oil. HOLLIHAN, J. P., AND BRIGGS, D. R. *J. Phys. Chem.*, 47, *pp.* 30–39, *Jan.*, 1943.—Viscosity data on dilute CCl_4 solutions of tung oils which had undergone various degrees of non-oxidative heat treatment can be interpreted as indicative of a progressive increase in deg. of asymmetry of the oil micelles with time of bodying. These data can also be repr. by the exponential form of the Einstein equation for spherical particles. In the latter case, a progressive increase in the viscometrically effective partial sp. vol. of the oil micelles is indicated. [See Abstr. 3129 (1942)].

1596 532.137 : 621.892

Viscosity characteristics of lubricating oils saturated with natural gases at high pressures. SWEARINGEN, J. S., AND REDDING, E. D. *Industr. Engng Chem.*, 34, *pp.* 1496–1498, *Dec.*, 1942.—A study of the effects of blending to improve the characteristics of lubricating oils for natural-gas compressors at pressures up to 3 500 lb./in.^{2} A description of the h.p. capillary-flow viscometer is given.

See Abstr. 1671 532.612 : 541.265 : 536.655

1597 532.63 : 576.72

Some theoretical considerations concerning the interchange of metabolites between capillaries and tissue. BLOCH, I. *Bull. Math. Biophys*, 5, *pp.* 1–14, *March*, 1943.—The previous treatment [Abstr. 1026 (1942)] of diffusion of oxygen from an idealized capillary is made more exact; the treatment is valid for any substance which diffuses between blood and tissue, though the physical situation is still somewhat idealized. A general equation is derived but not solved. An approx. treatment of the case in which all capillaries within a certain sphere have ceased to flow is given; conditions are discussed under which cells at the centre of this sphere will die.

1598 532.691 : 535.668 : 541.128

Zinc oxide pigments. The surface area and catalytic activity. SILLER, C. W. *J. Amer. Chem. Soc.*, 65, *pp.* 431–434, *March*, 1943.—A series of ZnO pigments was prepared which varied in particle size but had similar surface characteristics as judged from the results of catalysis experiments. The catalytic activity was $\propto$ the surface area of the pigments.

1599 532.695 : 541.18.05

Pigment dispersion with surface-active agents. FISCHER, E. K., AND JEROME, C. W. *Industr. Engng Chem.*, 35, *pp.* 336–343, *March*, 1943.—The experiments were limited to major types of pigment-vehicle systems as determined by basic wetting-characteristics. Well characterized surface-active agents were selected, each repr. a class of compounds. Additional variables included dispersion procedures, concentrations, pigment-vehicle ratios and methods of addition. Data are given on the rate of strength development as a measure of dispersion rate and the rheological properties of the compositions. While a deg. of sp. action is associated with each reagent, several criteria have been established to aid in the selection of agents for sp. purposes. The deg. of flocculation, indicated by measurements of plastic viscosity and yield value, can be materially affected by surface-active agents.

1600 532.712

Osmotic pressures of polyvinyl chloride solutions by a dynamic method. FUOSS, R. M., AND MEAD, D. J. *J. Phys. Chem.*, 47, *pp.* 59–70, *Jan.*, 1943.—A dynamic osmometer suitable for solutions in organic solvents, and the preparation of osmometer membranes, consisting of partially denitrated nitrocellulose, is described. The o.p. at a series of conc. of fractionated vinyl chloride polymers in methyl amyl ketone at 27°C. were determined. The mol. wt. of a fractionated sample determined osmometrically checks

he value obtained for the same polymer by the ultra-entrifuge. The osmometric values for other fractions f the same original polydisperse polymer check iscometric values, using the first polymer as a cali-rating substance for the viscometer method.

See Abstr. 1594 532.712 : 541.24 : 532.133

See Abstr. 1687 532.739.2 : 536.775 : 537.363

See Abstr. 1609 532.77 : 534.321.9

1601 532.77 : 535.324

Analytical data for the systems carbon-tetrachloride–cetic-acid–benzene and carbon-tetrachloride–tetra-hloroethylene. McMillan, W. R., and McDonald, H. J. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 114–116, *Feb.* 15, 1943.

1602 532.77 : 541.132

The activity coefficient of potassium iodide in sulphur dioxide from vapour-pressure measurements. Eversole, W. G., and Hanson, A. L. *J. Phys. Chem.*, 47, *pp.* 1–9, *Jan.*, 1943.—Differential lowering of v.p. was measured for SO_2-solutions of KI. Using the Randall–Longtin h' function, the activity coeff. for KI are calculated.

1603 533.15 : 669.24

The diffusion of air through monel metal. Coleman, H. S., and Yeagley, H. L. *J. Chem. Phys.*, 11, *pp.* 135–139, *March*, 1943.—An evacuated heavy-walled metal tube, a section of which was machined to a thin wall, was heated in a furnace. The rate at which the pressure inside the tube increased as a result of the diffusion of gases from the atmosphere was noted. The log R *v.* $1/T$ curves, which are usually linear, show breaks about 900°C. indicating some physical change occurring in the alloy. Dilatometric measurements were used to check the location of this break.

SOUND. VIBRATIONS

1604 534.13 : 576.3

Theory of cellular pulsations. Stanton, H. E. *Bull. Math. Biophys*, 5, *pp.* 15–21, *March*, 1943.—The frequency of periodic elongations of a cell is calculated as a function of the cell vol. for Rashevsky's dynamical theory of a cell.

See Abstr. 1610 534.14 : 620.15 : 534.647

1605 534.143 : 534.321.9 = 3

An ultrasonic-wave transmitter driven by an arc generator. Zschirnt, H. H. *Hochfrequenztechn. u. Elektroakust.*, 60, *pp.* 126–135, *Nov.*, 1942. *Abstr. in Wireless Engr*, 20, *p.* 254, *May*, 1943.

1606 534.143 : 534.321.9 = 3

A new sonic and ultrasonic transmitter for the production of strong intensities in gases. Ehret, L., and Hahnemann, H. *Z. techn. Phys.*, 23, 10, *pp.* 245–266, 1942. *Abstr. in Wireless Engr*, 20, *p.* 255, *May*, 1943.

See Abstr. 1593 534.2 : 532.12

1607 534.22

The determination of velocity of sound by the employment of closed resonators and the hot-wire microphone. Tucker, W. S. *Phil. Mag.*, 34, *pp.* 217–235, *April*, 1943.—A resonator consisting of 2 cavities connected by a narrow neck is employed. Sound is introduced by a telephone diaphragm forming the boundary of one enclosure, and temperature and response of the resonator to sound are indicated by the change in electrical resistance of a hot wire in the neck of the resonator. Frequency-response curves are obtained from which the true resonance frequency max. is obtained. Theoretical support is given of a linear relationship betw. velocity and resonance frequency for different gases. Determinations of velocity of sound for air saturated with water vapour were made and data obtained for calculation of γ. From this the velocity of sound in water vapour at 0°C. was deduced. Results were also obtained for the velocity of sound in ether and acetone vapours by a similar process.

1608 534.222.1 : 535.326

The specular reflection of plane wave pulses in media of continuously variable refractive properties. Rose, M. E. *Phys. Rev.*, 63, *pp.* 111–120, *Feb.* 1 *and* 15, 1943.—The problem is treated by the wave theory. For the case in which the vel. of propagation and the radiation impedance vary sufficiently slowly that multiple reflection may be neglected, the reflection coeff. is obtained for monochromatic waves incident on a set of n plane-parallel plates. The result for monochromatic waves is used to obtain the reflection coeff. for a plane wave pulse of arbitrary shape and duration. The reflected wave train consists of a series of pulses of the same form as the incident pulse with the amplitude reduced by the value of the Fresnel reflection coeff. Periodicity of the coeff. is unnecessary. The results for the n-plate problem are generalized for monochromatic waves and pulses for the case of stratified media having reflective properties which vary continuously in any manner. The case of rectangular pulses is analysed and application is made to the reflection in sea water and in the atmosphere.

1609 534.321.9 : 532.77

Propagation of supersonic waves in liquid mixtures and intermolecular forces: ether and acetone in chloroform. III. Parshad, R. *Indian J. Phys.*, 16, *pp.* 307–315, *Oct.*, 1942.—Ultrasonic velocities and adiabatic compressibilities of ether-chloroform and acetone-chloroform were determined. The compressibility/conc. curves [Abstr. 3018 (1942)] lie below and above the straight lines for ideal mixtures in ether-chloroform and acetone-chloroform, respectively. Both H bonds and dipole associations are present.

See Abstr. 1605 534.321.9 : 534.143 = 3

1610 534.647 : 534.14 : 620.15

Vibration testing. Vibration meters to measure oscillating stresses in apparatus. Vibration motors to produce oscillations for testing purposes. Fehr, R. O. *Gen. Elect. Rev.*, 45, *pp.* 695–699, *Dec.*, 1942.—A description of the most commonly used vibration meters and vibration motors from the standpoint of ranges, advantages and disadvantages, and their application to the more important problems in the field of vibration engineering. G. E. A.

1611 534.838.1

Recording machinery noise characteristics. Brailsford, H. D. *Electronics*, 15, *pp.* 46–51, *Nov.*, 1942.—Cutting and play-back apparatus is described in detail. A moving-film camera operated in conjunction with an oscilloscope and a sound analyser automatically plots the frequency spectra. E. R. A.

1612 534.84

Selected problems in architectural acoustics. RETTINGER, M. *Proc. Inst. Radio Engrs, N.Y.*, 31, *pp.* 18–22, *Jan.*, 1943.—Deals with the absorption of h.f. sound in air, the change of h.f. reverberation with rel. humidity of the air and the average surface absorptivity required to provide const. reverberation time for frequencies > 1 kc./s. Noted also is the energy reduction of h.f. sound with change in reverberation and the air attenuation of h.f. sound as a function of distance. The effects of sound interference are pictured as a function of the distance betw. source of sound and the point of observation.

OPTICS

See Abstr. 1702 535.13 : 530.12 : 538.3

1613 535.21 : 577.15.035

Methods and instruments for the selective irradiation of chromatin. ZAMENHOF, S. *Rev. Sci. Instrum.*, 14, *pp.* 17–21, *Jan.*, 1943.—Methods and instruments to produce minute spots of ultra-violet light to realize selective irradiation of chromatin in living cells are discussed theoretically and checked experimentally. Two methods were developed: lens method and screen method. While the diffraction phenomena restrict the lower limit of the size of the irradiated spot, yet a spot $0{\cdot}2\ \mu$ in dia. with the lens method, and $1\ \mu$ in dia. with the screen method, is obtainable. Biological material suitable for experimentation (certain protozoa, spermatozoa) is discussed briefly.

1614 535.215

A light effect in chlorine under electric discharge: influence of the intensity and frequency. JOSHI, S. S., DEO, P. G. *Nature, Lond.*, 151, *p.* 561, *May* 15, 1943.

1615 535.215 : 621.383.4

The spectral response of photo-electric cells. LANCE, T. M. C. *Electronic Engng*, 15, *pp.* 501–504, *May*, 1943.—[Abstr. 1529 B (1943)].

1616 535.215.4 : 537.531

Photo-electric efficiencies of some metals in the soft X-ray region. RAO, S. R., AND RAMAMURTI, K. K. *Curr. Sci.*, 11, *pp.* 460–461, *Dec.*, 1942.

1617 535.231.2 = 3

A cavity radiator for high temperatures. NORTHDURFT, W., AND WILLENBERG, H. *Phys. Z.*, 43, 9–10, *pp.* 138–140, 1942.—The construction of an electrically heated tungsten-tube, cavity radiator is described which is used as a std. for testing tungsten hand-lamps and for the accurate production of colour temperatures. It is operated at 2 500°K. H. G. S.

1618 535.24 : 535.7

Analytical representation of standard response curves. MOON, P., AND SPENCER, D. E. *J. Opt. Soc. Amer.*, 33, *pp.* 89–103, *Feb.*, 1943.—The std. visibility (response) curve for the eye to visible radiation is expressed in the form of a table of values. For certain problems, involving integration, an analytical representation of the curve is preferable. Various suggestions for a suitable formula have been made and these are examined in turn from the point of view of (*a*) the accuracy with which they repr. the tabulated values and (*b*) their suitability for mathematical manipulation. The expression finally proposed is $Ae^{-q/\lambda}\lambda^{-p}$ where $\log A = 35{\cdot}2037916$, $p = 182{\cdot}19050$, $q = 100{\cdot}93700$. J. W. T. W.

1619 535.241.41

Flux calculations in optical systems. HARDY, A. C. *J. Opt. Soc. Amer.*, 33, *pp.* 71–74, *Feb.*, 1943.—Describes the basis on which the irradiance (or the illumination) of an optical image can be calculated from a knowledge of the emittance (or brightness) of the source and the characteristics of the optical system. J. W. T. W.

1620 535.245.1 : 628.971.6 = 3

Evaluation of lighting fittings and calculation of illumination values for street-lighting installations by means of the "Standard-Light-Patch-Method." BERLEPSCH-VALENDAS, W. V. *Bull. Ass. Suisse Élect.*, 33, *pp.* 630–633, *Nov.* 4, 1942.—If every street-lighting fitting were accompanied by a map of values of illumination produced on a plane 10 m. below it, when using a light source giving 1 000 l., it would be easy to find the distribution of illumination in any actual street, for any given mounting height and lamp rating. The method is described by means of an example and details are given of the way in which maps of this kind could be prepared by the suppliers of fittings. J. W. T. W.

1621 535.247.4

Measuring faint light. BAKER, T. T. *Elect. Rev., Lond.*, 132, *pp.* 343–345, *March* 12, 1943.—Describes some of the characteristics of different types of photo-electric cells, with particular ref. to the measurement of photographic densities. J. W. T. W.

See Abstr. 1654 535.247.4 : 535.371

1622 535.247.4 : 535.434

A null-reading photo-electric microdensitometer. BAIER, J. G., JR. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 144–148, *Feb.* 15, 1943.—Describes the construction and operation of a densitometer employing two photo-electric vacuum tubes in a balanced bridge circuit with electronic amplification. The circuit includes a voltage-regulator tube. Readings are obtained by adjusting a light wedge, calibrated in per cent light transmission from 100 to 0, to balance the amount of light absorbed by the unknown over the control. The electronic circuit, operating on the null-reading principle, is used to indicate the balance point.

See Abstr. 1690 535.3 : 537.531

1623 535.31 : 77

The rectification of photographs taken with an inclined plate. BLOCH, A. *Photgr. J.*, 83, *pp.* 85–90, *March*, 1943.—The problem of obtaining a "rectified" print from a negative not originally parallel in plane with the object is given simple mathematical treatment. It is shown that it is possible to produce a correct print from a given negative; that, within limits, an enlarging lens of any focal length may be employed, and that the position of the nodal point with respect to the negative is not at disposal but is fixed. A. H.

See Abstr. 1581 535.312 : 531.66 : 531.18 = 60

1624 535.312.3

Note on image formation by rotating mirrors. SMITH, T. *Proc. Phys. Soc., Lond.*, 55, *pp.* 210–214, *May*, 1943.—When we view a scene through a system

f mirrors, some or all of which are moving with niform ang. vel. about fixed axes, the motion of the nage may have components of several periods. If ne image moves with uniform ang. vel. about a xed axis, this velocity is twice the sum or difference f some or all of the ang. vel. of the mirrors; odd ultiples of these ang. vel. are excluded. If we wish o bring a moving scene to rest by mirrors, it is ssential to use a half-speed reflector.

1625 535.315

Analysis of errors in a reflecting prism. STEVENS, W. *J. Opt. Soc. Amer.*, 33, *pp.* 74–78, *Feb.*, 943.—A theoretical treatment is given of the errors roduced by faulty prisms so that performance may e judged from a single measurement in a test in- rument. A. H.

See Abstr. 1601 535.324 : 532.77

See Abstr. 1608 535.326 : 534.222.1

1626 535.33/.34

Conference on spectroscopy held at the University f Chicago, June, 1942. *Rev. Mod. Phys.*, 14, p. 55–340, *April–July*, 1942.—Introduction, Mulli- en, R. S.; The primary standard of wavelength, leggers, W. F. [Abstr. 1588 (1943)]; Construction nd use of reflection echelons, Williams, W. E.; ieneralized theory of the concave grating, Beutler, I. G.; Identification of orders and ghosts in grating pectra by diffracting slits, Pomerance, H. S., and eutler, H. G. [Abstr. 1656 (1943); Application of tomic beams in spectroscopy, Meissner, K. W. Abstr. 1719 (1943)]; Atomic-beam light sources pplied to the structure of the magnesium I resonance ne, Fisher, R. A. [Abstr. 1720 (1943)]; Atomic-beam pparatus for studying the atomic spectra of gases, specially hydrogen, Mack, J. E., and Barkofsky, . C. [Abstr. 1721 (1943)]; Attempts at obtaining xcitation of an atomic beam of monatomic hydrogen, Villiams, W. E. [Abstr. 1722 (1943)]; Atomic spectra f rare-earth elements, Meggers, W. F. [Abstr. 1632 1943)]; The absorption spectra of potassium, ubidium and caesium, Kratz, H. R., and Mack, J. E.; pectra of ions in fields of various symmetry in rystals and solutions, Freed, S. [Abstr. 1639 (1943)]; lectron-transfer spectra and their photochemical ffects, Rabinowitch, E. [Abstr. 1633 (1943)]; luorescence and phosphorescence of thallium- ctivated potassium-halide phosphors, Pringsheim, P. Abstr. 1653 (1943)]; Meteors and the Earth's upper tmosphere, Whipple, F. L.; The light of the night ky, Elvey, C. T. [Abstr. 1280 (1943)]; The geo- hemistry of the atmosphere and the constitution of he terrestrial planets, Wildt, R. [Abstr. 1820 (1943)]; tructural texture of comets, Biesbroeck, G. Van; hysical theory of comets in the light of spectroscopic ata, Bobrovnikoff, N. T. [Abstr. 1567 (1943)]; ntensity measurements on emission bands in come- ary spectra, McKellar, A. [Abstr. 1568 (1943)]; Molecular bands in cometary spectra. Identifica- ions, Swings, P. [Abstr. 1569 (1943)]; Evidence for the resence of CH_2 molecules in comets, Herzberg, G. Abstr. 1570 (1943)]; The infra-red spectra of triatomic olecules, Barker, E. F. [Abstr. 1637 (1943)]; Elec- ronic structures and spectra of triatomic oxide mole- ules, Mulliken, R. S. [Abstr. 1636 (1943)]; Emission pectrum of the ion CO_2^+, Mrozowski, S. [Abstr. 1634 (1943)]; *l*-type doubling in linear polyatomic molecules, Herzberg, G. [Abstr. 1712 (1943)]; Ultra- violet absorption spectra of substituted benzenes, Sponer, H. [Abstr. 1647 (1943)]; Electronic absorp- tion spectra of benzene and its derivatives, Sklar, A. L. [Abstr. 1641 (1943)]; Rotational structure of the near ultra-violet bands of benzene, Turkevich, A., and Fred, M. [Abstr. 1638 (1943);] Calculation of the absorption spectrum of Wurster's salts, Mayer M. G., and McCallum, K. J. [Abstr. 1643 (1943)]; Interpretation of ultra-violet absorption spectra in terms of resonance structures, Rodebush, W. H.; Bond integrals and spectra, Mulliken, R. S., and Rieke, C. A.; The absorption spectra of a series of dienes, Carr, E. P., Pickett, L. W., and Stücklen, H. [Abstr. 1642 (1943)]; Structure and ultra-violet spectra of ethylene, butadiene, and their alkyl deriva- tives, Mulliken, R. S. [Abstr. 1648 (1943)]; Absorp- tion and resonance in dyes, Brooker, L. G. S. [Abstr. 1644 (1943)]; Colour and constitution of polymethine dyes, Herzfeld, K. F., and Sklar, A. L. [Abstr. 1645 (1943)]; The effects of environment and aggregation on the absorption spectra of dyes, Sheppard, S. E. [Abstr. 1646 (1943)].

1627 535.33

Some observations on the use of powders in spectro- chemical analysis. RUEHLE, A. E., AND JAYCOX, E. K. *J. Opt. Soc. Amer.*, 33, *pp.* 109–112, *Feb.*, 1943.—The advantages of using powders instead of solutions in spectrochemical analysis are detailed and discussed. Procedure for Pb-Sn solders is given together with specimen results. A. H.

1628 535.33.03

The open-arc method of exciting the Balmer series. GANESAN, A. S. *Curr. Sci.*, 12, *pp.* 18–19, *Jan.*, 1943.

1629 535.331 : 669.14

Quantitative spectrographic analysis of stainless steels. HASLER, M. F., HARVEY, C. E., AND DIETERT, H. W. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 102–110, *Feb.* 15, 1943.—A spectrographic method of analysis is described that allows rapid and accurate quantitative analyses of all metallic constituents in stainless-steel stock. A d.c. arc and a special C electrode allow Cr and Ni analyses accurate to 2%. Satisfactory Si, Mn, Cb, Mo and Ti analyses can also be made. Complete analytical details are furnished, including a method of calculating results that takes into consideration the variation in Fe content.

1630 535.331.03

A study of the applicability of the pressed-pellet electrode method to the spectrographic analysis of nickel alloys. NEUHAUS, C. J. *J. Opt. Soc. Amer.*, 33, *pp.* 167–174, *March*, 1943.—Spark investigation is examined using a pellet as one electrode, Fe, Mg and Mn being chosen as test elements. Full details for making pellets from millings, filings, etc., are given. A variety of variations in operating conditions are examined and their effect on the spectra discussed. A. H.

1631 535.333-1 : 678.7

Synthetic rubber. BARNES, R. B., LIDDEL, U., AND WILLIAMS, V. Z. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 83–90, *Feb.* 15, 1943.

See Abstr. 1719, 1720, 1721 535.336 : 539.181

1632 535.338.3

Atomic spectra of rare-earth elements. MEGGERS, W. F. *Rev. Mod. Phys.*, 14, *pp.* 96–103, *April–July*, 1942.—A general survey.

See Abstr. 1588 535.338.3 : 531.71.082.5

1633 535.338.4

Electron-transfer spectra and their photochemical effects. RABINOWITCH, E. *Rev. Mod. Phys.*, 14, *pp.* 112–131, *April–July*, 1942.—Surveys the present position in the field of electron-transfer (electron-affinity) spectra. The occurrence of such spectra with gaseous molecules and crystals, the spectra of anions and cations in solution and of cation-anion complexes are discussed at length. The discussion is based on published results, no new observations being presented. A. H.

1634 535.338.4

Emission spectrum of the ion CO_2^+. MROZOWSKI, S. *Rev. Mod. Phys.*, 14, *pp.* 216–218, *April–July*, 1942.—A preliminary notice of some of the results obtained in the analysis (rotational) of the emission spectrum of the CO_2^+ ion. Earlier work is discussed. A. H.

1635 535.338.4

Bands forming Rydberg series and ionization potential of carbon monoxide. ANAND, B. M. *Sci. and Cult.*, 8, *pp.* 278–279, *Dec.*, 1942.

1636 535.338.42 : 539.153

Electronic structures and spectra of triatomic oxide molecules. MULLIKEN, R. S. *Rev. Mod. Phys.*, 14, *pp.* 204–215, *April–July*, 1942.—Existing knowledge of the forms and the electronic spectra of a series of triatomic oxide and similar molecules BAB is reviewed. The evidence (mostly from infra-red data) which establishes the acute-angled model of ozone is discussed, new points being added. New conclusions concerning the structure of ozone are given. A new diagram is introduced showing the ionization energies of the various normal and excited valence-shell molecular orbitals as a function of the apex angle BAB. The forms of the mol. orbitals of CO_2 are reviewed.

See Abstr. 1712 535.338.42 : 539.153

1637 535.338.42-1

The infra-red spectra of triatomic molecules. BARKER, E. F. *Rev. Mod. Phys.*, 14, *pp.* 198–203, *April–July*, 1942.—Surveying triatomic molecules as a group, a few special cases (SO_2, H_2O, HCN, CO_2, N_2O) are reviewed in order to indicate the variety of the observed infra-red bands and the type of information that is obtainable from them. A. H.

1638 535.338.42-31

Rotational structure of the near ultra-violet bands of benzene. TURKEVICH, A., AND FRED, M. *Rev. Mod. Phys.*, 14, *pp.* 246–247, *April–July*, 1942.

See Abstr. 1691 535.34 : 537.531

1639 535.343

Spectra of ions in fields of various symmetry in crystals and solutions. FREED, S. *Rev. Mod. Phys.*, 14, *pp.* 105–111, *April–July*, 1942.—Summarizes our knowledge of the influence of fields of the environment upon the spectra of ions. In particular, the applicability of Bethe's theory to crystals is considered and the results of experiments with crystals and solutions are discussed. A. H.

1640 535.343

Anomalous distribution of intensity in Lyman series and the extinction of L_4(949·7 Å). ANAND, B. M. *Sci. and Cult.*, 8, *pp.* 277–278, *Dec.*, 1942.

1641 535.343.3

Electronic absorption spectra of benzene and its derivatives. SKLAR, A. L. *Rev. Mod. Phys.*, 14, *pp.* 232–245, *April–July*, 1942.—A theoretical discussion of the benzene molecule with a view to determining what absorption bands might be expected for the system of nuclei and electrons composing the molecule. In the case of the observed long-wavelength electronic band systems a 1–1 correspondence with the calculations is obtained. The discussion extends to benzene derivatives. A. H.

1642 535.343.3

The absorption spectra of a series of dienes. CARR, E. P., PICKETT, L. W., AND STÜCKLEN, H. *Rev. Mod. Phys.*, 14, *pp.* 260–264, *April–July*, 1942.—A brief review of work on the absorption spectra of 18 mono-olefines and 2 cyclic hydrocarbons containing 1 double bond. General relationships and characteristics indicated by the exp. results are discussed. A. H.

1643 535.343.3

Calculation of the absorption spectrum of Wurster's salts. MAYER, M. G., AND MCCALLUM, K. J. *Rev. Mod. Phys.*, 14, *pp.* 248–258, *April–July*, 1942.—The frequency and intensity were calculated by completely antisymmetrized products of molecular orbitals, with the introduction of but 1 empirical const., namely the difference betw. the ionization potential of the non-bonding N electron in NH_3 and the ionization potential of benzene.

1644 535.343.3 : 541.651

Absorption and resonance in dyes. BROOKER, L. G. S. *Rev. Mod. Phys.*, 14, *pp.* 275–293, *April–July*, 1942.—The rel. betw. structure and light absorption in organic compounds can be studied by determining the constitution of coloured compounds and noting by what structural peculiarities they differ from non-coloured compounds. A more modern method is based on the primary quantum-mechanical concept that absorption is possible where a molecule can exist in different energy states. The bulk of the results were obtained by the classical method and certain relationships are traced and explanations suggested which are based on simple concepts derived from the resonance theory. A. H.

1645 535.343.3 : 541.651

Colour and constitution of polymethine dyes. HERZFELD, K. F., AND SKLAR, A. L. *Rev. Mod. Phys.*, 14, *pp.* 294–302, *April–July*, 1942.—The typical polymethine dye may be discussed theoretically by either the valence-bond method or by the mol. orbital method. Both approximations give the general behaviour for the symmetrical ion but otherwise fail at different points. A. H.

1646 535.343.3 : 541.651

The effects of environment and aggregation on the absorption spectra of dyes. SHEPPARD, S. E. *Rev. Mod. Phys.*, 14, *pp.* 303–340, *April–July*, 1942. Errata, *ibid.*, *p.* 410, *Oct.*, 1942.—A survey article which discusses solutions and solvents, effects of acidity and basicity of solvents, resonance systems

rel. to solvent effect, ionized cyanines and asic cyanine dyes, electrochem. considerations, the ature of the aggregate in water, nature of the forces aggregation, the adsorption of dyes, the origin of -bands, hetero-polymerization in the mesophase, the eat of mesophase formation and the film spectra of yes. A large amount of exp. material is presented a condensed form, mainly graphical. A. H.

1647 535.343.3-31

Ultra-violet absorption spectra of substituted benenes. SPONER, H. *Rev. Mod. Phys.*, 14, *pp.* 224–31, *April–July*, 1942.—Using as basis the interpretaon of the near ultra-violet absorption spectrum of enzene, predictions are made of the nature of the lectronic levels and the general appearance of the pectra of substituted benzenes. A. H.

1648 535.343.3-31 : 539.132

Structure and ultra-violet spectra of ethylene, butaiene and their alkyl derivatives. MULLIKEN, R. S. *ev. Mod. Phys.*, 14, *pp.* 265–274, *April–July*, 1942.— critical survey is made of existing knowledge on the bsorption spectra near $\lambda 2\,000$. Results of preliminary quantum-theoretical computations of Rieke and he writer on electronic-term values and on red shifts ue to hyperconjugation with alkyl groups are reorted. Decreases in ionization potential on alkyl ubstitution are due mainly to charge transfer, but ed shifts in spectra result partly from this and partly om hyperconjugation. The stability of the planar rrangement in various electronic states of the molelle and its positive ion is discussed.

1649 535.343.4

An absorption tube for the investigation of gases at ow pressures. LEIGHTON, P. A., AND VOLMAN, D. H. *Opt. Soc. Amer.*, 33, *pp.* 79–80, *Feb.*, 1943.—Metal ubes being unsuitable for the study of the absorption pectra of certain compounds, a long glass tube is mployed. The total length is 155 ft., internal dia. in. and the tube is built up in 10 ft. lengths. Using n oil diffusion pump, vacua of 10^{-4}–10^{-5} mm. are btainable. Details are also given of the optical rrangements and of the special high-intensity ydrogen lamp which will operate continuously on -5 A at 500 V. A. H.

1650 535.343.4-1 = 4

Method of detection and determination of gases by eir infra-red absorption. BAUER, E., AND LEVIALDI, *Rev. Univ. Nac. Tucumán*, 3, *pp.* 111–120, *June*, 942.—The infra-red absorption of gases is selective ough to enable the method to be used for the dection and determination of gases. Two methods are escribed, one direct, based on the selectivity of the mission of flames, and the other differential and pplicable to any source. The method is investigatd particularly in its application to the detection and etermination of CO. It will indicate conc. of CO of e order of 1 in 100 000. A. J. M.

1651 535.37

Quenching of fluorescence by nitric oxide. WEILALHERBE, H., AND WEISS, J. *Nature, Lond.*, 151, 449, *April* 17, 1943.

1652 535.37 : 621.321

Activating light sources for luminescent materials. EGGS, E. W. *J. Opt. Soc. Amer.*, 33, *pp.* 61–70, *eb.*, 1943.—[Abstr. 1508 B (1943)].

1653 535.371

Fluorescence and phosphorescence of thallium-activated potassium-halide phosphors. PRINGSHEIM, P. *Rev. Mod. Phys.*, 14, *pp.* 132–138, *April–July*, 1942.—The fluorescence of Tl solutions is considerably decreased when KCl is added, and particularly when the mixture is crystallized, when a large proportion of the Tl is removed from solution. Other K halides exert a similar effect, but not Na halides. The crystals obtained from a KCl–Tl solution are strongly fluorescent and phosphorescent, the optical properties being very similar to those of KCl-Tl single-crystal phosphors. In particular, the absorption bands are the same. The phosphorescence is investigated and discussed. A. J. M.

1654 535.371 : 535.247.4

Photo-electric fluorimeter. KREBS, R. P., AND KERSTEN, H. J. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 132–133, *Feb.*, 15, 1943.—Describes the constructional details of an a.c. operated fluorimeter using vacuum photocells. J. W. T. W.

1655 535.412

On the intensity of distribution of Fraunhofer diffraction pattern and the Rayleigh criterion for the limit of resolution. CHATTERJEE, L. M. *Sci. and Cult.*, 8, *pp.* 312–313, *Jan.*, 1943.

1656 535.421

Identification of orders and ghosts in grating spectra by diffracting slits. POMERANCE, H. S., AND BEUTLER, H. G. *Rev. Mod. Phys.*, 14, *pp.* 66–67, *April–July*, 1942.

1657 535.43 : 548.55

Scattering of light in single crystals. BHAGAVANTAM, S., AND NARAYANA, J. V. *Proc. Indian Acad. Sci. A*, 16, *pp.* 366–368, *Dec.*, 1942.—Intensity and depolarization measurements of Rayleigh scattering were made in cut and polished single crystals of calcite and quartz, with sp. ref. to directional excitation. Results, with the intensity in dust-free air as std., are given.

1658 535.43 : 621.892 = 3

New tests for lubricating oils. STÄGER, H., AND KÜNZLER, H. *Schweiz. Arch. angew. Wiss. Techn.*, 9, *pp.* 15–24, *Jan.*, 1943.—[Abstr. 1590 B (1943)].

See Abstr. 1622 535.434 : 535.247.4

See Abstr. 1803 535.544 : 519.4 : 548

See Abstr. 1740 535.565 : 541.123.2

1659 535.6 : 628.97

Salvaging waste light for victory. BRAINERD, A. A., AND MASSEY, R. A. *Illum. Engng, N.Y.*, 37, *pp.* 738–757, *Dec.*, 1942.—The previous investigation [Abstr. 1288 (1942)] is extended to include not only the working area but the whole room. The selection of colours to produce max. comfortable visibility for any definite operation is analysed, and a colour selector is described by means of which colours can be chosen for any industrial area. By scientific colour utilization the illumination can be increased 100% without any change in the lighting equipment or increase in the wattage. H. G. S.

See Abstr. 1598 535.668 : 541.128 : 532.691

See Abstr. 1618 535.7 : 535.24

1660 535.73

Physiology of colour vision. EDRIDGE-GREEN, F. W., HARTRIDGE, H. *Nature, Lond.*, 151, *p.* 422, *April* 10, 1943.

1661 535.81.08 : 531.717

A multi-purpose collimator. BRACEY, R. J. *Proc. Phys. Soc., Lond.*, 55, *pp.* 182–188, *May*, 1943.—The collimator consists of an achromatic object glass with a graticule placed in its focal plane, the graticule having divisions 1/10 and 1/100 of the equiv. focal length of the object glass. Additional features are (1) that about $\frac{3}{4}$ along the tube from the object glass a half-silvered prism is fitted, with an additional eye-piece mounted at rt.a. The introduction of this prism causes the focal plane of the object glass to be displaced, and (2) in this new focal plane is placed a removable cell containing a stainless-steel mirror with a circular pinhole at its centre. This provides an artificial star, but its main function is to turn the collimator into a spherometer, when supplementary lenses are mounted in front of the collimator, thus bringing the parallel beam to a focus. Details are given of the method of using such a collimator for measuring (1) radii of curvature of lens surfaces, (2) the equivalent focal length of a positive lens, (3) the back focal length of pos. or neg. lenses, (4) certain prism angles ($\pi/4$ and $\pi/6$), and for interferometric tests of plates for parallelism. A. W.

1662 535.824.39 : 621.327.43

A fluorescent microscope lamp. BERKELHAMER, L. H. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 833–834, *Oct.* 15, 1942.—Sufficient light can be obtained for use with high-power microscopy and low-magnification photomicrography. Daylight-type bulbs give illumination comparable to that obtained from the ordinary microscope lamp using a daylight filter, but without an uncomfortable radiation of dissipated heat.

1663 535.825

A light-and-shadow box as a visual aid in measuring spectra. HOPFIELD, J. J. *J. Opt. Soc. Amer.*, 33, *pp.* 113–114, *Feb.*, 1943.

HEAT. THERMODYNAMICS

1664 536.2.02

A problem in two-dimensional flow. AWBERY, J. H. *Proc. Phys. Soc., Lond.*, 55, *pp.* 202–203, *May*, 1943.—A formal solution is given for a two-dimensiona lflow problem. [Abstr. 1552 (1942)].

1665 536.42

The triple point of water. WARING, W. *Science*, 97, *pp.* 221–222, *March* 5, 1943.—A common error in text-books on physical chemistry is pointed out. The correct value for the t. pt. temp. is + 0·0098°C. The equilibrium v.p. for ice and liquid water under 2 different sets of equilibrium conditions are compared with the t.pt. pressure.

See Abstr. 1562 536.421.4 : 518.3

1666 536.5

Temperature-measuring instruments. LINFORD, A. *Engng Boil. Ho. Rev.*, 56, *pp.* 210–217, *Dec.*, 1942, *and* 57, *pp.* 2–8, *Jan.*, 1943.—Reviews the design and application of temperature-measuring instruments, dividing them into (1) Those operated by a change in length of a solid, or volume or pressure of a liquid; (2) those operated by a change in some electrical function caused by a change in temperature, and (3) those based on principles of radiation. E. R. A.

1667 536.51.089.6

A bath for use in the graduation and testing of thermometers. GRACE, A., AND HALL, J. A. *J. Sci. Instrum.*, 20, *pp.* 60–63, *April*, 1943.—A description is given of a stirred liquid bath which, by using various liquids, covers a range from − 70°C. to + 630°C. The circulating pump is so arranged that it is removed from contact with the hot liquid and always operates at air temperature. Heating is done electrically using a tapped auto-transformer. A safety device is fitted in which a fusible plug, upon melting, releases a safety switch in the main circuit. M.-V.

1668 536.516.2

The Sunvic ambient-temperature recorder. *Engineering*, 155, *p.* 206, *March* 12, 1943.—The drum-type recorder is based on the principle of the difference in expansion of the 2 sides of a bimetallic strip. The method of connecting the strip to the recording mechanism is explained and the theory of its operation is given. M.-V.

1669 536.6 : 536.75 : 541.66

The heat capacity and entropy, heats of transition, fusion and vaporization and the vapour pressures of cyclopentane. Evidence for a non-planar structure. ASTON, J. G., FINK, H. L., AND SCHUMANN, S. C. *J. Amer. Chem. Soc.*, 65, *pp.* 341–346, *March*, 1943.—The heat capacity of solid and liquid cyclopentane was measured from 11·8° to 293·82°K. The equilibrium temperatures of the lower transition, the upper transition and the fusion, together with their heats, were determined. The heat of vaporization was determined at 298·16°K. The exp. v.p. equation over the range 220° to 287°K. is used to calculate values of the ht. of vap. at 230°, 260° and 298·16°K. Comparisons of the exp. entropy with that calculated from statistical and molecular data at 230° and 298·16°K. indicate a symmetry number of 1 and that the cyclopentane ring is non-planar, one C atom being out of the plane. This effect is attributed to hydrogen interactions of the type hindering internal rotation which must therefore be repulsions.

1670 536.631 : 536.75

Specific heats at low temperatures of magnesium orthosilicate and magnesium metasilicate. KELLEY, K. K. *J. Amer. Chem. Soc.*, 65, *pp.* 339–341, *March*, 1943.—The sp. ht. of Mg_2SiO_4 and $MgSiO_3$ were measured in the range 51° to 298°K. The corresp. entropies are computed.

1671 536.655 : 532.612 : 541.265

Parachor and latent heat of vaporization. TELANG, M. S. *Curr. Sci.*, 11, *pp.* 461–462, *Dec.*, 1942.

1672 536.66 : 621.43.019 = 3

Reaction products of a petrol-air mixture temporarily compressed but not ignited in the motor. DAMKÖHLER, G., AND EGGERSGLÜSS, W. *Z. phys. Chem. B*, 51, *pp.* 157–186, *March*, 1942.—A quantitative determination of the following reaction products was made: CO_2, H_2O, acids, CH_2O, C_2H_4O and higher aldehydes. Reaction heats were determined. The formation of the formaldehyde must be different from that of the acetaldehyde and higher aldehydes.

The various possibilities of formaldehyde formation are discussed. R. N.

See Abstr. 1746 536.666 : 541.124

See Abstr. 1677 536.7 : 539.133 : 532.133 : 537.226

1673 536.7 : 621.1

Some recent applications of thermodynamics in steam-engineering research. SILVER, R. S. *J. Sci. Instrum.*, 20, *pp.* 53–58, *April*, 1943.—Several instances are given where useful results can be obtained from the application of thermodynamic theory to problems in steam engineering. These include fluid circulation in boilers, particularly for a saturated mixture of water and steam, cavitation, the flow of saturated steam through an orifice, nuclear boiling and the removal of gases dissolved in water. The discrepancy betw. observation and earlier theories for the quantity of saturated water discharged through an orifice is due to lack of sufficient time for evaporation. R. W. P.

See Abstr. 1670 536.75 : 536.631

See Abstr. 1669 536.75 : 541.66 : 536.6

1674 536.758

Thermal equilibrium between elementary particles. WATAGHIN, G. *Phys. Rev.*, 63, *p.* 137, *Feb.* 1 and 15, 1943.—[See Abstr. 1739 (1942)].

1675 536.775

The phase behaviour of lithium palmitate with water and with lithium chloride and water. VOLD, M. J. *J. Amer. Chem. Soc.*, 65, *pp.* 465–469, *March*, 1943.—The phase behaviour of Li palmitate in water was determined and compared with that of Na palmitate. Comparison is made of available phase diagrams for Na and K soaps. In conc. soap systems and in dilute ones, the temperatures and compositions of corresp. points vary in a regular manner with the atomic number of the alkali cation, but at intermediate compositions no simple general trends are apparent.

See Abstr. 1687 536.775 : 532.739.2 : 537.363

ELECTRICITY. MAGNETISM

1676 537.12

Direct determination of the charge of the β-particle. BEERS, Y. *Phys. Rev.*, 63, *pp.* 77–85, *Feb.* 1 *and* 15, 1943.—The charge of radium E β-particles was measured by measuring the charge carried per sec. by a magnetically analysed beam and then, after the beam had been reduced by a known fraction by the decay of the source, counting the number of particles per sec. in the beam.

See Abstr. 1703 537.217 : 530.12 : 539.185 : 538.3

1677 537.226 : 536.7 : 539.133 : 532.133

The dielectric dispersion and absorption of water and some organic liquids. CONNER, W. P., AND SMYTH, C. P. *J. Amer. Chem. Soc.*, 65, *pp.* 382–389, *March*, 1943.—Apparatus is described for the measurement of permittivity and absorption for $\lambda = 9{\cdot}72$ cm. Water was measured from 0° to 100° and 16 organic compounds at 25°. The viscosities of the organic compounds were measured. The relaxation times of the molecules are calculated from the absorptions and used, in the case of water, to calculate the free energies, heats and entropies of activation for the process of mol. rotation in the light of the abs. reaction-rate theory. The polarization of water is due to mol. orientation in the applied field rather than to proton transfer. The relaxation times of the organic molecules increase consistently with their size and the extent of their departure from spherical form.

1678 537.226 : 539.133 = 3

Dispersion of ultra-short waves in polar liquids with several relaxation times. KLAGES, G. *Phys. Z.*, 43, 9–10, *pp.* 151–166, 1942.—The dispersion measurements are conducted in the wavelength region of 8 cm.–2 m. The 2nd Drude method is employed, rel. measurements being made with the aid of calibration substances (air, benzene, CS_2 and benzene-acetone mixtures). The substances investigated comprise *m*-chlorinated diphenyl, aliphatic chlorides and *n*-cetyl-chloride mixtures with non-polar molecules. Their dispersion curves are flatter than those of substances of 1 relaxation time. H. G. S.

1679 537.226.2 : 550.372 : 621.396.67 : 621.317.33

The determination of the electrical properties of soil at a wavelength of 5 m. (60 Mc./s.). MCPETRIE, J. S., AND SAXTON, J. A. *J. Instn Elect. Engrs*, 99, *Part* III, *pp.* 33–35, *March*, 1943.—[Abstr. 1492 B (1943)].

1680 537.228.1 : 621.396.622.6(083.72)

Proposed standard conventions for expressing the elastic and piezo-electric properties of right and left quartz. CADY, W. G., AND DYKE, K. S. VAN. *Proc. Inst. Radio Engrs, N.Y.*, 30, *pp.* 495–499, *Nov.*, 1942.—It is recommended to employ only that definition of right and left quartz which is now generally accepted, and that uniform conventions be agreed upon for axial directions and rotations. Voigt's usage in the main is advocated with the exception that a r.h. system of axes be used for right quartz, l.h. for left quartz. A table showing the conventions used by various authors is included.

1681 537.228.4

Voltage fluctuations in resistors (Johnson effect). CAMPBELL, N. R., AND FRANCIS, V. J. *Phil. Mag.*, 34, *pp.* 259–265, *April*, 1943.—Johnson's formula for fluctuations appearing in valve circuits owing to the thermal energy of the resistors is proved, using the principles of Brownian motion. The rel. betw. the Johnson effect in resistors and the shot effect in a saturated electronic current is brought out. A. J. M.

1682 537.311.3 : 614.84

Electrical conductivity of snow and gas discharged from first-aid carbon dioxide extinguishers. HENDRICKS, R. W., AND BENJAMIN, E. P. *Underwriters' Lab., Inc. Nat. Board Fire Underwriters, Bull. Res., No.* 26, [19 *pp.*], *July*, 1942.—Tests indicated that snow and gas are non-conductive even in presence of voltages up to 100 000 V a.c., so long as extinguisher horns retain their original high dielectric qualities. E. R. A.

1683 537.311.33 : 548

Volume rectification of crystals. SEN, B. K. *Indian J. Phys.*, 16, *pp.* 329–335, *Oct.*, 1942.—It is found that volume rectification occurs with crystals which possess centres of symmetry; and it is concluded that point and volume rectification are due to the same

mechanism. Rectification varies from point to point in amount and sense and the volume rectification produced depends on the final resultant rectified current for any particular adjustment of the contact areas of the electrodes. J. T.

1684 537.312.6 : 539.234

A theory of the irreversible electrical resistance changes of metallic films evaporated in vacuum. VAND, V. *Proc. Phys. Soc., Lond.*, 55, *pp.* 222–247, *May*, 1943.—Metallic films prepared by evaporation show characteristic irreversible changes, especially if prepared at low temperatures. The changes can be explained by a decay of lattice distortions. To allow of a mathematical treatment, a set of simplifying assumptions is formulated. To initiate a decomposition of a distortion, a certain energy must be reached but the observed changes cannot be explained if all distortions have the same decay energy. A characteristic function F_0 expressing the law of distribution of the decay energies is formulated, calculated from measurements available and found to be of the expected order. The shape of this function and the position of its max. depend on the structure of the support and on the thickness of the film.

See Abstr. 1705 537.312.6 : 669.71 : 538.632

1685 537.312.62 = 3

Experimental proof of unsteady processes in the transition normal conduction ⇌ supraconduction in the magnetic field. JUSTI, E. *Phys. Z.*, 43, 7–8, *pp.* 130–133, 1942.—In the transition normal conduction ⇌ supraconduction of NbN and Nb in the magnetic field, noises similar to those in the Barkhausen effect are induced in the search coil wound on the supraconductor. The existence of supraconducting micro-domains in the intermediate state is thus established by the experiments, which are fully described. The premise follows that the theory of magnetism is applicable to the problems of supraconduction. [See Abstr. 395 (1943)]. H. G. S.

1686 537.361

The electrical capacitance of the double layer. EVERSOLE, W. G., AND ESTEE, C. R. *J. Chem. Phys.*, 11, *p.* 156, *March*, 1943.—[See Abstr. 2117 (1942)].

1687 537.363 : 532.739.2 : 536.775

Solubility and electrophoretic studies of serum globulin. I. Gamma globulins. JAMESON, E., and ALVEREZ-TOSTADO, C. *J. Amer. Chem. Soc.*, 65, *pp.* 459–465, *March*, 1943.—A method for the preparation of homogeneous constituents of γ-globulins is described, using $K_3C_6H_5O_7$ in place of $(NH_4)_2SO_4$. Const. solubilities were found for 2 globulin fractions. Electrophoretic measurements were made on 4 different fractions of γ-globulin (range 1·1–1·7). Solubility behaviour and electrophoretic results are explained in terms of a mobile equilibrium betw. a complex and its components.

1688 537.363 : 678.02

An electrophoretic study of the proteins in rubber latex serum. ROE, C. P., AND EWART, R. H. *J. Amer. Chem. Soc.*, 64, *pp.* 2628–2632, *Nov.*, 1942.—The serum from unpreserved rubber latex (*Hevea brasiliensis*) contains 7 electrophoretically distinct protein components. The proteins from whole serum originating in Sumatra and Florida give very similar results in electrophoresis experiments. The rel. betw. electrophoretic mobility and *p*H was determined for 5 of the 7 protein components of unpreserved total latex serum. The results are different from those with NH_3-preserved latex. NH_3 treatment alters the electrophoretic behaviour of the native protein components and reduces the number of resolvable components from 7 to 2. The preparation of dry latex protein can be accomplished by the vacuum sublimation of frozen serum. This process does not change the electrophoretic properties of the total serum proteins.

1689 537.523.5 : 621.791.75 : 621.367

The physics of the arc. SPRAGUE, W., AND LENGYEL, B. A. *Weld. J., pp.* 2*s*–42*s*, *Jan.*, 1943.—[*Abstr.* 1526 B (1943)].

See Abstr. 1616 537.531 : 535.215.4

1690 537.531 : 535.3

X-ray wavelengths: notation. WILSON, A. J. C. *Nature, Lond.*, 151, *p.* 562, *May* 15, 1943.

1691 537.531 : 535.34

Probable X-ray mass absorption coefficients for wavelengths shorter than the *K* critical absorption wavelength. VICTOREEN, J. A. *J. Appl. Phys.*, 14, *pp.* 95–102, *Feb.*, 1943.—Presents an empirical formula which agrees well with experimental data. J. T.

1692 537.531.7

Mode of chemical action of X-rays on a non-aqueous solution. BRODA, E. *Nature, Lond.*, 151, *p.* 448, *April* 17, 1943.

1693 537.531.7 : 633.4

The effect of ionizing radiations on the broad-bean root. V. The lethal action of X-radiation. GRAY, L. H., READ, J., AND POYNTER, M. *Brit. J. Radiol.*, 16, *pp.* 125–128, *April*, 1943.

1694 537.531.8 = 3

On the practical range of the secondary electrons of radium-like X-radiation. HESSE, B., AND JAEGER, R. *Phys. Z.*, 43, 7–8, *pp.* 117–120, 1942.—With X-rays of a min. wavelength of 25 XU down to 12·3 XU the practical max. ranges of the recoil electrons are measured from the electron saturation value and compared with those from RaC. These are considerably greater than for a 10^6 V radiation. The results are compared with the ranges of fast electrons in dependence upon the primary wavelength, as well as of the recoil electrons from the values calculated from the Klein–Nishina quantum-mechanical theory by Mayneord [Abstr. 5258 (1934)]. In practice, for X-rays up to 10^6 V, the chamber walls should have a thickness of from 1·5–2 mm. of graphite. H. G. S.

1695 535.533.8 = 3

On the secondary emission of condensed films of antimony. GÖRLICH, P. *Phys. Z.*, 43, 7–8, *pp.* 121–123, 1942.—The secondary emission of condensed Sb-films depends upon the film thickness and the base. Only with film thicknesses $>> 380\,m\mu$ does the secondary emission coeff. assume a const. value and become independent of the base. The technical utility of these films is briefly discussed. [Abstr. 2410 (1941)]. H. G. S.

1696 537.533.92

Ionization and dissociation by electron impact: the methyl and ethyl radicals. HIPPLE, J. A., AND

STEVENSON, D. P. *Phys. Rev.*, 63, *pp.* 121–126, *Feb.* 1 *and* 15, 1943.—The tetra-alkyls, $Pb(CH_3)_4$ and $Pb(C_2H_5)_4$, were decomposed to yield free methyl and ethyl radicals in a specially designed furnace built into the ionization chamber of a 180° mass spectrometer tube. From the initial breaks of the ionization eff. curves of the ions, CH_3^+ and $C_2H_5^+$, the ionization potentials of the methyl and ethyl radicals were found.

1697 537.534.74

Inelastic scattering of protons. DICKE, R. H., AND MARSHALL, J., JR. *Phys. Rev.*, 63, *pp.* 86–90, *Feb.* 1 *and* 15, 1943.—Protons scattered at 135° by a thin foil are detected by a proportional counter feeding a scaling circuit which is biased to count only the large pulses resulting from slowly moving protons. Al stopping foils introduced between the scatterer and counter are used to slow down the scattered protons so that protons of a particular energy group move through the counter slowly and are counted. A plot of the number of counted protons against stopping foil thickness gives a curve in which peaks appear for different proton energy groups.

1698 537.591.08 = 3

An approved photographic recorder. KOLHÖRSTER, W., AND LANGE, K. *Phys. Z.*, 43, 7–8, *pp.* 123–125, 1942.—For making a larger number of records of cosmic-ray impulses than would be convenient with printometers [Abstr. 201 (1943)] an instrument for photographing the cyclometer counter readings on a film at definite time intervals is described. Two interior views are given of the instrument and a reproduction of a film showing 7 pictures of the 16 cyclometer counters embodied in it. H. G. S.

1699 537.591.8

The specific primary ionization of cosmic rays in helium. HAZEN, W. E. *Phys. Rev.*, 63, *pp.* 107–110, *Feb.* 1 *and* 15, 1943.—A magnetic field allowed separation into 2 groups: 21 electrons with energies near the energy for min. ionization had a mean ionization of $7{\cdot}33 \pm 0{\cdot}12$ per cm., and 26 mesotrons with energies near the energy for min. ionization had a mean ionization of $7{\cdot}23 \pm 0{\cdot}12$ per cm. The exp. value for the min. spec. primary ionization in He is $6{\cdot}5 \pm 0{\cdot}1$ at N.T.P. Three protons were observed in the $H\rho$ range in which they can easily be identified; in this range 3 particles constituted approx. 1% of the radiation.

1700 538.214

The magnetic susceptibility of the brown ferric phenanthroline complex. MICHAELIS, L., AND GRACK, S. *J. Amer. Chem. Soc.*, 65, *pp.* 481–482, *March*, 1943.

1701 538.22 : 552.1

Laboratory experiments on the magnetization of rocks. HERROUN, E. F., AND HALLIMOND, A. F. *Proc. Phys. Soc., Lond.*, 55, *pp.* 214–221, *May*, 1943.—Specimens of natural rock masses were tested for magnetic susceptibility and permanent magnetization before and after artificial treatments. After cooling in the earth's field, cut cubes were found to be magnetized with an intensity much greater than that of the natural rock, and the values decayed little with time. When artificially magnetized in the cold, the cubes were only affected by fields above a certain value, and the decay was often considerable. Curves are given showing the decay with time and the demagnetization of the heated cubes by increasing fields. The susceptibility of natural rocks increases with the field, in some cases reaching a max. betw. 50 and 100 c.g.s.

1702 538.3 : 530.12 : 535.13

Rational electrodynamics. III. The charge as a point singularity. MILNE, E. A. *Phil. Mag.*, 34, *pp.* 197–211, *March*, 1943.—The system of electrodynamics, beginning with particles in motion instead of, in the classical system, with particles at rest, which was previously suggested [Abstr. 1483 (1943)], is further developed. Various relations analogous to those of Maxwell are given, and it is pointed out that the usual electromagnetic theory of light follows from the new viewpoint. A. J. M.

1703 538.3 : 537.217 : 530.12 : 539.185

Rational electrodynamics. IV. The "radius" of a point charge. V. The neutron and nuclear dynamics. MILNE, E. A. *Phil. Mag.*, 34, *pp.* 235–258, *April*, 1943.—The general theory previously developed [Abstr. 1702 (1943)] is applied to the interaction of 2 point charges. Equations for the motion of one charge with resp. to the other are obtained, and an equation for the apparent force betw. the charges is obtained which is similar to other equations obtained empirically. In Part V the interaction of 2 point charges is further considered, the charges being opposite in sign and one being much more massive than the other. Orbits are obtained which are similar to the classical Keplerian orbits, but further orbits appear which give systems corresp. to the existence of the neutron. These circular neutron orbits are unstable, though it is shown that an electron will, in general, spend an appreciable time in their neighbourhood before either escaping to infinity or falling into the nucleus. The non-circular orbits are analysed in detail. A proton has a potential barrier at a given distance, and when an electron passes through this barrier the law of conservation of energy is violated. A. J. M.

1704 538.551 : 531

Applications and limitations of mechanical-electrical analogies, new and old. MILES, J. *J. Acoust. Soc. Amer.*, 14, *pp.* 183–192, *Jan.*, 1943.—The general problem is discussed. The advantages of the mobility system are demonstrated, especially when used with the methods of circuit analysis. Torsional, geared and linear systems are discussed. The use of a mechanical-electrical analogy in a system involving both electromagnetic and electrostatic coupling is fundamentally impossible.

1705 538.632 : 537.312.6 : 669.71

The Hall effect and some other physical constants of alloys. VII. The aluminium-silver series of alloys. POWELL, H., AND EVANS, E. J. *Phil. Mag.*, 34, *pp.* 145–161, *March*, 1943.—Petrenko's equilibrium diagram of the Al-Ag system is discussed, followed by a description of experiments with 16 alloys prep. from pure Al and pure Ag in which the resistivities, temp. coeff. of resistance, thermo-electric powers and Hall coeff. were measured after annealing at temperatures deduced from the equilibrium diagram. The results are discussed in rel. to thermal micrographic and X-ray observations on the system. Ag_3Al is

probably the only intermetallic compound in the system. The graph of Hall coeff. *v.* composition indicates that alloys containing 73·5% and 89·5% Ag have a zero Hall coeff. The data confirm Petrenko's conclusions of phase boundaries at 88·5, 92·3 and 96·1% Ag, and a fourth boundary at 85% Ag is indicated. H. H. HO.

1706 538.665 : 621.318.24

The adiabatic temperature changes accompanying the magnetization of iron in low and moderate fields. BATES, L. F., AND HEALEY, D. R. *Proc. Phys. Soc., Lond.*, 55, *pp.* 188–202, *May*, 1943.—The method of measurement of heat changes which accompany step-by-step changes in the magnetization of ferromagnetic materials [Abstr. 147 (1941)] has been applied to the study of Armco iron, annealed or cold-drawn. The measurements appeared sufficiently reliable to permit a detailed analysis to be made of the energy changes in the stages of the hysteresis cycle. Evidence was found for the existence of a discontinuity in the magnetization of iron in fields of 350 to 400 oersteds.

1707 538.71 : 550.384

A proposed method of measuring the derivatives of the earth's magnetic field. JONES, J. H. *Geophysics*, 8, *pp.* 23–30, *Jan.*, 1943.—The method depends on the fact that a small steady magnetic field will modify the e.m.f. induced in the secondary coil of a detector with a core of magnetizable material possessing high initial permeability and a high rate of increase of the permeability with the strength of the magnetizing field. It is shown that a detector of this type is equivalent to an inductor coil rotating with angular speed = the periodicity of the alternating magnetizing field.

MOLECULAR AND ATOMIC PHYSICS

1708 539.132

A note concerning *l*-type doubling in linear polyatomic molecules. NIELSEN, H. H., AND SHAFFER, W. H. *J. Chem. Phys.*, 11, *pp.* 140–144, *March*, 1943.—It is shown that certain Coriolis interaction terms in the rotation-vibration Hamiltonian of a linear polyatomic molecule give second-order contributions to the energy which remove the degeneracy of levels associated with the quantum number l of internal angular momentum arising from a doubly degenerate perpendicular mode of oscillation. This type of splitting is called *l*-type doubling because it is exactly like Λ-type doubling in the electronic energy levels of diatomic molecules.

See Abstr. 1648 539.132 : 535.343.3-31

1709 539.133

Magnetic moments and the vibratory electron. ROBERTSON, I. A. *Phil. Mag.*, 34, *pp.* 182–196, *March*, 1943.—A summary of some of the properties of the vibratory electron is given. The magnetic moments of systems of revolving electrons are considered. This magnetic moment depends on the orientation of neighbouring electron systems. A neg. electron revolving in a circular orbit round a fixed pos. electron has properties differing from those of all other systems of revolving electrons. When coupled with a similar system it has no simple magnetic moment. When 2 or more pairs of electrons are revolving in co-axial circles about fixed pos. charges, simple magnetic moments exist, but the values differ from the usual where the number of pairs is 2 or 3. For 4 or more electrons coupled with a similar system, the vibrational theory leads to a formula agreeing with that derived from Ampère's theorem. A. J. M.

See Abstr. 1677 539.133 : 532.133 : 536.7 : 537.226

See Abstr. 1678 539.133 : 537.226 = 3

1710 539.152.1

The structure of atomic nuclei. SOONAWALA, M. F. *Indian J. Phys.*, 16, *pp.* 291–305, *Oct.*, 1942.—The possibility of atomic nuclei consisting of smaller nuclei of comparable masses is discussed. The depth and width of the potential holes corresp. to the nuclear energy are calculated. The expected masses and charges of the exchange particles holding the nuclei together are calculated. The nuclear spins of some of the rare gases are derived by comparison.

1711 539.152.1

A note on the analysis of the nuclear binding energies. VAND, V. *Phil. Mag.*, 34, *pp.* 280–285, *April*, 1943.—The function $L(A)$, appearing in Wigner's theory is calculated from the observed mass defects and from the chemically determined atomic weights of the elements. Most probably the curve $L(A)$ is not a smooth function of A, but the accuracy of the individual values of L is insufficient to give the character of the irregularities. An empirical two-const. formula, disregarding the oscillations, is suggested.

1712 539.153 : 535.338.42

***l*-type doubling in linear polyatomic molecules.** HERZBERG, G. *Rev. Mod. Phys.*, 14, *pp.* 219–223, *April–July*, 1942.—The infra-red spectra of C_2H_2, HCN and CO_2 give evidence of a splitting of the Π vibrational levels (in which a $\perp$ vibration is singly excited) into 2 components analogous to the Λ-type doubling of the electronic states of diatomic molecules, called *l*-type doubling. The existence of the *l*-type doubling explains that the fundamental bands of HCN and C_2H_2 do not show a convergence of the P and R branches while the Q branch is shaded to shorter wavelengths. A preliminary theoretical treatment is given. Taking the *l*-type doubling into account, the rot. const. α_l of CO_2 have been evaluated.

See Abstr. 1636 539.153 : 535.338.42

1713 539.155.2 : 539.162

Radioactive isotopes of lanthanum. WEIMER, K. E., POOL, M. L., AND KURBATOV, J. D. *Phys. Rev.*, 63, *pp.* 67–72, *Feb.* 1 *and* 15, 1943.—La^{140}, known to be produced by deuteron and slow-neutron bombardments of La, has a ½-life of 40·0 ± 0·3 hr. This isotope has been produced by the reaction $Ce^{140}(n, p)La^{140}$. Evidence for the occurrence of a d, y reaction was obtained through the formation of La^{140} by the reaction $Ba^{138}(d, y)La^{140}$. Deuteron and also proton bombardments of Ba produce a new radioactive isotope of La of ½-life 17·5 ± 0·5 hr. This activity decays by the process of *K*-electron capture with the emission of X-rays identified as the characteristic *K* radiation of Ba.

1714 539.155.4 = 3

On the definition of the Loschmidt number. POHL, R. W. *Phys. Z.*, 43, 7–8, *pp.* 125–128, 1942.—

Three definitions of this physical concept are given and discussed. It is proposed to use sp. mol. number N_L, the ratio of the number of molecules to the mass, instead of Loschmidt's number. The numerical value is $N_L = 6{\cdot}02 \times 10^{23}$/mol, where mol = (M) gram and (M) = mol. wt. H. G. S.

1715 539.16.08 : 550.423

Radioactivity analyses of oil-well samples. Pontecorvo, B. *Geophysics*, 7, *pp.* 90–94, *Jan.*, 1942.—A laboratory method of analysing the radioactivity of rock samples is described in which the laboratory tests are designed to simulate the conditions which prevail when radioactivity logs of wells are made.

1716 539.162

The search for element no. 87. Hirsh, F. R., Jr. *Phys. Rev.*, 63, *pp.* 93–95, *Feb.* 1 *and* 15, 1943.—[See Abstr. 2147 (1937)]. An attempt to secure the element 87 $L_{\alpha 1,2}$ X-ray lines in fluorescence spectra is made with neg. results. The fluorescent material was $CsHSO_4$ derived from lepidolite, in which free Tl has been found.

See Abstr. 1713 539.162 : 539.155.2

1717 539.163.2

Gamma rays from As^{76}. Mandeville, C. E. *Phys. Rev.*, 63, *pp.* 91–93, *Feb.* 1 *and* 15, 1943.—The recoil electron spectrum of the γ-rays from As^{76} was examined in a magnetic spectrograph. The spectrum was found to be composed of 2 electron groups corresp. to quantum energies of $0{\cdot}83 \pm 0{\cdot}02$ and $1{\cdot}94 \pm 0{\cdot}04$ eMV, the intensity ratio being 3·8 : 1. No contributions to the spectrum of γ-rays of energy greater than 1·94 eMV were observable.

1718 539.166.74

A simple method for the investigation of secondary electrons excited by γ-rays and the interference of these electrons with measurements of primary β-ray spectra. Meitner, L. *Phys. Rev.*, 63, *pp.* 73–76, *Feb.* 1 *and* 15, 1943.—The special directional distribution of the Compton electrons can be used to obtain their absorption curve and therefore their upper energy limit without coincidence measurements. The complexity of the primary β-ray spectrum of Fe^{59} [Abstr. 3195 (1938)] is apparently due to interference of secondary electrons. Problems connected with the directional distribution of the Compton electrons and the eff. of γ-counters are discussed.

1719 539.181 : 535.336

Application of atomic beams in spectroscopy. Meissner, K. W. *Rev. Mod. Phys.*, 14, *pp.* 68–78, *April–July*, 1942.—Spectroscopes of very high r.p. are now available and the main problem remaining is the production of a light source which will get over the broadening of the spectral lines due to Doppler effect. Atomic beams enable this width to be reduced without use of low temperatures. The construction of atomic-beam apparatus using absorption, fluorescence and electron impact methods are discussed, incl. the study of intensity distribution in lines of fine and of hyperfine structure. Applications to Zeeman and inverse Stark effect are discussed. A. H.

1720 539.181 : 535.336

Atomic-beam light sources applied to the structure of the magnesium I resonance line. Fisher, R. A. *Rev. Mod. Phys.*, 14, *pp.* 79–81, *April–July*, 1942.—The electronic-beam method gives lines 5 times as sharp as those produced by the ring discharge although the latter is 20 to 30 times more intense. Observations of the structure of the Mg I resonance line λ2 852 show 3 resolved components corresp. to the 3 isotopes mass 24, 25 and 26, the abundance ratio being 7 : 1 : 1. This result is in much closer accord with calculations than were earlier observations. A. H.

1721 539.181 : 535.336

Atomic-beam apparatus for studying the atomic spectra of gases, especially hydrogen. Mack, J. E., and Barkofsky, E. C. *Rev. Mod. Phys.*, 14, *pp.* 82–93, *April–July*, 1942.—A description is given of an atomic-beam apparatus built for the study of the Hα-line. The paper is mainly theoretical and goes into great detail reg. the geometrical design. There is included an examination of the Doppler effect, 5 indep. contributions to this being considered: (*a*) original atomic vel., (*b*) atomic vel. gained by excitation, (*c*) atomic vel. gained by emission, (*d*) spread of light in optical system, (*e*) errors in orientation. A. H.

1722 539.181.2

Attempts at obtaining excitation of an atomic beam of monatomic hydrogen. Williams, W. E. *Rev. Mod. Phys.*, 14, *pp.* 94–95, *April–July*, 1942.

See Abstr. 1703 539.185 : 537.217 : 530.12 : 538.3

1723 539.216.1 : 677

Principal characteristics of the important textile fibres. Bergen, W. von. *Mech. Engng, N.Y.*, 65, *pp.* 183–190, *March*, 1943.

See Abstr. 1738 539.23 : 539.6

1724 539.23 : 539.62

Frictional properties of metallic films. Schnurmann, R., Hughes, T. P. *Nature, Lond.*, 151, *pp.* 420–421, *April* 10, *and pp.* 533–534, *May* 8, 1943.

1725 539.23 : 621.385.833 = 3

On a temperatureproof and durable carrier film for electron interference pictures and supermicroscopic investigations. Hass, G., and Kehler, H. *Kolloid Z.*, 95, *pp.* 26–29, *April*, 1941.—Layers of Al_2O_3 have proved to be especially suitable for replacing collodion [see Abstr. 1359 (1942)] as they may be obtained with reproducible properties and withstand high temperatures. Examples are given of diffractional and electron-optical pictures of the film alone and in its use as a carrier film for various substances. R. N.

See Abstr. 1684 539.234 : 537.312.6

ELASTICITY. STRENGTH

1726 539.3 : 679.5 : 674.049.2

Strength characteristics of plastic-bonded plywood. Parsons, G. B. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 1–7, *Jan.*, 1943.—[Abstr. 1629 B (1943)].

1727 539.3 : 679.5 : 674.049.2

Bearing strength of plastics and plywood. Bond, J. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 9–14, *Jan.*, 1943.—[Abstr. 1630 B (1943)].

1728 539.319

Graphitization of steel influenced by tessellated stresses. László, F. *J. Iron Steel Inst.*, [4 *pp.*],

April, 1943. *Advance copy.*—A study of the tessellated stresses set up on cooling carbon steel supports the theory that the graphite is precipitated from the ferrite matrix and is not a product of the direct decomposition of cementite. [See Abstr. 753 (1943)].

1729 539.373

State of strain and fracture due to slip deformation. SIEGFRIED, W. *Schweiz. Arch. angew. Wiss Techn.*, 9, *pp.* 1–14, *Jan.*, 1943.—A review of the present state of knowledge regarding the state of strain in a metal and the cause of fracture. Rosenhain and Ewen's view [see Abstr. 1339 (1919)], that the crystals of a metal are held together by an amorphous viscous intercrystalline cement which yields when an applied stress tends to cause flow, is the basis of the explanation of a number of recent observations of intercrystalline fractures which have occurred after prolonged application of stress. The behaviour of a material is considered in which the strength of the intercrystalline matter is (*a*) greater, (*b*) less than that of the crystallite. Although the problem is of fundamental importance in the construction of machinery, no method is at present available to indicate the beginning of an intercrystalline fracture when prolonged strain due to multidimensional stress has been present at a high working temperature. G. E. A.

1730 539.373

Results of experiments on metallic beams bent beyond the elastic limit. VOLTERRA, E. *J. Instn Civ. Engrs*, 20, *pp.* 1–19, *March*, 1943.—The investigation covers the bending moment from which the first plastic deformations originate, the form and magnitude of these deformations and the plotting of the diagram revealing the rel. betw. the b.m. and the curvature, and the effect of hardening which always accompanies the bending of a beam beyond the yield-point. Contrary to a hypothesis of Prager's, plastic deformations in a bent beam always begin to appear before the b.m. reaches the extreme value for which all the section would be in a plastic condition. The results obtained confirm the hypothesis of Danusso and Colonnetti which identifies the effect of plastic deformation in hyperstatic structures with the effect produced by an elastic dislocation of the so-called V. Volterra type, but not the hypothesis of the equalization of stresses formulated by Bleich and others. G. E. A.

1731 539.384.2

The approximate theory of the displacements produced in encastré beams due to the elasticity of the supports. NEWING, S. T. *Phil. Mag.*, 34, *pp.* 162–182, *March*, 1943.—An investigation of the displacement which is produced in a cantilever or a doubly encastré beam if the foundations into which the fixed end of the beam is built are assumed to be elastic and to abut on rigid supports. The displacement function within the limits of the elastic foundation is derived, and graphs are drawn which show that, for a light beam with a load at its free end, the displacement is only appreciable within the second half of the foundation, and considerable only within the fourth quarter. Foundation columns of various sizes, and other aspects of the problem, are discussed. G. E. A.

1732 539.41 : 679.5 : 620.16

Researches on the mechanical strength of plastics. FRISCHMUTH, B. *Schweiz. Arch. angew. Wiss. Techn.*, 9, *pp.* 24–35, *Jan.*, 1943.—[Abstr. 1436 B (1943)].

1733 539.501

Simple apparatus for studying deformation of soft materials under compression and tension at constant stress. BLAIR, G. W. S., AND VEINOGLOU, B. *J. Sci. Instrum.*, 20, *pp.* 58–60, *April*, 1943.—Apparatus is described for extending cylinders or strips and for compressing cylinders in such a way that the load per unit of average cross-sections remains const. for big strains. The accuracy is adequate for most industrial rheological measurements or materials soft enough to be considered as incompressible.

1734 539.501

The softening of thermoplastic polymers. I. Theoretical. TUCKETT, R. F. *Trans. Faraday Soc.*, 39, *pp.* 158–168, *June*, 1943.—The general deformation produced in an amorphous high-polymeric material by a given stress is analysed into its 3 components: ordinary elastic, highly elastic and viscous. These all have different dependencies on mol. size, structure, temperature and duration of stress—the effect of these variables is worked out and the information is used to analyse the empirical softening-point tests which are in use to characterize plastics. Such tests fall into 2 main groups: (1) Those which measure the flow properties of materials and, as such, are of use in evaluating correct moulding conditions; (2) those which measure the temperature at which high elasticity develops—this is important in assessing heat distortion properties of the material under working conditions. A typical flow-property test is analysed further and, on the assumption that softening points of this type are essentially *iso*-viscous states, a relation betw. mol. size and softening temperature, based on Flory's relationship, is predicted and shown to hold experimentally for polyvinyl acetates. A critical survey of recent estimates of polymer viscosities is given, it being shown that the viscous properties of such systems have often been confused with highly elastic ones.

1735 539.501 : 541.18.025

Analysis of the thixotropy of pigment-vehicle suspensions. GREEN, H., AND WELTMANN, R. N. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 201–206, *March* 15, 1943.—An investigation of thixotropic systems by means of the hysteresis loop is described. The controversial points in the rheology of thixotropic systems are discussed: (1) The non-linearity of the lower end of the consistency curve, (2) the 3 different yield values, (3) the apparent viscosity, (4) plastic flow without liquefaction. A detailed examination of the time and velocity-gradient elements in thixotropic breakdown is included, followed by a mathematical discussion of the up-curve and the derivation of its equation. Non-loopforming materials are assumed to be plastic without being thixotropic. The treatment is based on the reasonable assumption that the primary change occurring upon agitating a thixotropic suspension is a decrease in plastic viscosity. H. H. HO.

1736 539.531 : 549.211

Hardness differences in diamonds. GRODZINSKI, P. *Gemmologist*, 12, *pp.* 7–11, *Feb.*, *and pp.* 13–16, *March*,

943.—Hardness is understood by diamond cutters o mean wear resistance, whereas in scientific investigations the test applied, such as indentation, mpact, abrasive action etc., should be mentioned. Differences in hardness exist (*a*) in rel. to other naterials, (*b*) betw. diamonds from different localiies and (*c*) in the diamond itself. These are discussed with the aid of tables. Wear tests of a diamond oint are fully described. Hardness differences in rystals according to the orientation of faces towards he crystal axes are dealt with in the second issue. According to the atomic structure of the diamond the ube face is the softest and the octahedron face the ardest; facts for and against this result are cited.

G. E. A.

1737 539.6

The ploughing and adhesion of sliding metals. Bowden, F. P., Moore, A. J. W., and Tabor, D. *J. Appl. Phys.*, 14, *pp.* 80–91, *Feb.*, 1943.—Studies of he surface damage caused by the sliding of clean netals on one another show that penetration and distortion occur to some depth beneath the surface. Micro-examination shows that welding of the metals akes place even at low speeds of sliding. In some cases the welded junctions may pluck out portions of he harder metal. In general the frictional force between clean metal surfaces is made up of 2 parts, (1) the force required to shear the metallic junctions formed betw. the surfaces; (2) the ploughing force required to displace the softer metal from the path of the harder. By using steel sliders of various shapes and sizes on a soft metal, these factors have been estimated.

1738 539.6 : 539.23

The lubrication by thin metallic films and the action of bearing metals. Bowden, F. P., and Tabor, D. *J. Appl. Phys.*, 14, *pp.* 141–151, *March*, 1943.—With metallic films possessing suitable mech. and surface properties the coeff. of friction is low and may be similar to that observed on ice. The behaviour of these thin metallic films resembles that of ordinary lubricants except that Amonton's law is not obeyed. The friction and wear properties of some Cu-Pb alloys were studied and the results indicate that the Pb in the alloy is extruded during sliding and forms a thin lubricating film on the hard Cu matrix.

See Abstr. 1724 539.62 : 539.23

PHYSICAL CHEMISTRY

1739 541.123.2

Pure hydrocarbons from petroleum. Griswold, J., and Ludwig, E. E. *Industr. Engng Chem.*, 35, *pp.* 117–119, *Jan.*, 1943.—Atm. vapour/liquid equilibrium data for methylcyclopentane-benzene are presented. A min.-boiling azeotrope exists at approx. 90 mol % methylcyclopentane. Equilibria of binary systems containing aromatic hydrocarbons are discussed.

See Abstr. 1583 541.123.2 : 531.19

1740 541.123.2 : 535.565

Quantitative investigations of amino acids and peptides. X. Equilibria between amino acids and formaldehyde: leucine and *N*-methylleucine. XI. Equilibria between amino acids and formaldehyde: glutamic acid. Frieden, E. H., Dunn, M. S., and Coryell, C. D. *J. Phys. Chem.*, 47, *pp.* 10–24, *Jan.*, 1943.—[See Abstr. 1894 (1943)]. The polarimetric investigation of amino-acid–formaldehyde equilibria has been extended to include *N*-methylleucine and 1(−)-leucine. A potentiometric investigation of the former compound is also described. A considerable discrepancy is observed betw. equilibrium const. obtained by each method for the reaction of *N*-methylleucine and formaldehyde. A general solution is described for the 4 parameter equations denoting the change in rotation of leucine solutions upon the addition of formaldehyde. A polarimetric study of the equilibria betw. formaldehyde and 1(+)-glutaric acid is reported.

1741 541.123.4

Distribution equilibria in the system tin–stannous-sulphide. Anderson, J. S., and Ridge, M. J. *Trans. Faraday Soc.*, 39, *pp.* 93–98, *April–May*, 1943.—The distribution of Cu, Ag and Pb, present in low total conc., betw. the two liquid phases in the system Sn–SnS was studied at 910°. Pb is slightly, and Ag strongly concentrated in the metallic phase, while Cu is concentrated preferentially in the sulphide phase. The direction and magnitude of the distribution coeff. in such systems is not determined solely by the thermochemistry of the displacement reaction $M + SnS \rightleftharpoons MS + Sn$. The results are discussed with ref. to the constitution of metallic sulphides in the fused state.

1742 541.123.4

The system tin–stannous-sulphide. Anderson, J. S., and Ridge, M. J. *Trans Faraday Soc.*, 39, *pp.* 98–102, *April–May*, 1943.—There is a region of partial miscibility in the liquid state. The composition of the conjugate liquids was determined from their m.p. (858°) up to 1 180°C. The eutectic in this system lies close to metallic Sn.

1743 541.124

Kinetics of the transformation of hydrazine cyanate into semicarbazide. Baker, E. M., and Gilbert, E. C. *J. Amer. Chem. Soc.*, 64, *pp.* 2777–2780, *Dec.*, 1942.—Increase in ionic strength reduces reaction velocity in a manner which agrees with the postulate that the rate-determining process is the reaction betw. the hydrazine and cyanate ions. The reaction reaches an equilibrium far to the side of formation of semicarbazide. Quantitative results are presented on the velocity const. of the reaction at 15° and 25°, the equilibrium const., salt effects, temp. coeff. and heat of activation.

1744 541.124

A note on unimolecular reactions. Eley, D. D. *Trans. Faraday Soc.*, 39, *pp.* 168–172, *June*, 1943.—The applicability of well-known formulae to the case of unimolecular reactions is critically discussed. In the case of fast reactions, an experimental criterion is given to decide whether or not the fluctuation of energy inside the large molecule is the rate-determining step.

1745 541.124

The kinetics of haemoglobin reactions. Eley, D. D. *Trans. Faraday Soc.*, 39, *pp.* 172–181, *June*, 1943.—The data of Hartridge and Roughton are employed to calculate values of the energy and entropy of activation of the reactions of haemoglobin with O_2 and CO, in aq. solution. These values are discussed

with ref. to the energies and entropies of the related equilibria. The reaction with CO appears to be rel. normal. The reaction with O_2 is abnormal, the difference betw. the activation energies betw. the forward and back reactions being widely different from the heat of reaction. The activated complexes for the observed forward and back reactions are different, belonging to different steps in the chain of successive reactions postulated by Adair.

1746 541.124 : 536.666

Kinetics of hypoiodite decomposition. CHOH HAO LI, AND WHITE, C. F. *J. Amer. Chem. Soc.*, 65, *pp.* 335–339, *March*, 1943.—A method based on the rapid reaction betw. the phenol, tyrosine and hypoiodite is used to measure the rate of hypoiodite decomposition in highly alkaline solution. At 25° in highly alkaline solution the rate law is $-d(OI^-)/dt = 2{\cdot}9(OI^-)^2 + 104(OI^-)^2(I^-)/(OH^-)$. The heat of activation is computed from the kinetic data at 25° and 2° to be 12 400.

1747 541.124.4

The bearing of the dissociation constant of urea on its constitution. BELL, J., GILLESPIE, W. A., AND TAYLOR, D. B. *Trans. Faraday Soc.*, 39, *pp.* 137–140, *June*, 1943.—The basic dissociation const. of urea was re-measured (*ca.* $1{\cdot}47 \times 10^{-14}$ at 21°C.). Attempts to measure the acidic dissociation const. support the view that, while urea may be regarded as a weak base, it has no detectable amphoteric properties. The findings are contrary to the theory that urea in solution has a zwitterion structure. An attempt is made to explain the monobasicity and the low value of the basic dissociation const. in terms of resonance theory.

1748 541.124.7

A chemical interpretation of the mechanism of oxidation by dehydrogenase enzymes. WATERS, W. A. *Trans. Faraday Soc.*, 39, *pp.* 140–151, *June*, 1943.—General analogies betw. biochemical oxidations catalysed by dehydrogenases and free-radical chain oxidations are pointed out, and sp. emphasis is given to the fact that free radicals regularly dehydrogenate aliphatic molecules. An enzyme catalyst is regarded as a supplier of an active free radical, whereby a chain reaction involving a substrate and a co-enzyme, and ultimately oxygen or an oxidizing agent, is set up. This scheme is applied to several dehydrogenase systems, and the sp. rôle of phosphates in enzyme reactions receives comment. Many known enzymes can either give free radicals by dissociation of prosthetic groups (e.g. flavoproteins), or else can initiate single-electron oxidations and reductions (e.g. iron-porphyrins). The inhibition of sp. enzymes by KCN or Na iodoacetate is explicable as a destruction of free radicals, or as a replacement of active radicals by others too inert to perpetuate the reaction chain.

1749 541.126

The mechanism of the action of charcoal on potassium nitrate. I. The effect of temperature, time, etc. OZA, T. M., AND SHAH, M. S. *J. Univ. Bombay*, 11, *pp.* 56–69, *Nov.*, 1942.—The equation $4KNO_3 + 5C \rightarrow 2K_2CO_3 + 3CO_2 + 2N_2$, ascribed to the action of charcoal on KNO_3 is probably made up of 2 consecutive reactions: $4KNO_3 + 2C \rightarrow 4KNO_2 + 2CO_2$ and $4KNO_2 + 3C \rightarrow 2K_2CO_3 + CO_2 + 2N_2$, of which the latter represents the net result of several consecutive reactions.

1750 541.126

The thermal decomposition of potassium nitrite. OZA, T. M., AND SHAH, M. S. *J. Univ. Bombay*, 11, *pp.* 70–77, *Nov.*, 1942.—The primary stage is $2KNO_2 \rightleftarrows K_2O + NO + NO_2$. The N_2O_4 produced reacts with the undecomposed KNO_2: $4KNO_2 + 2NO_2 \rightarrow 4KNO_3 + N_2$ and $KNO_2 + NO_2 \rightarrow KNO_3 + NO$. The KNO_3, thus produced, decomposes under the exp. conditions as $2KNO_3 \rightarrow 2KNO_2 + O_2$ and the oxygen produced, together with the NO present in the system, affects the above reactions.

1751 541.127

Influence of age and surface conditions on the reactivity of certain precipitates. JAMES, T. H. *J. Phys. Chem.*, 46, *pp.* 1068–1076, *Dec.*, 1942.—Information concerning structural and surface changes in certain precipitates is obtained from a study of their reactivity with hydroxylamine. AgCl and AgCNS yield an increase in N_2O upon ageing, indicating a perfecting of the lattice. Small amounts of bromide ion produce marked decreases in N_2O. AgCl precipitates coated with Wool Violet show much smaller decreases when comparison is made at the same uptake of bromide by the precipitate. Blue $Cu(OH)_2$ reacts rapidly with hydroxylamine at *p*H 10·2, yielding almost wholly N_2O. As the precipitate ages, the initial reaction rate decreases. A sharp break develops in the reaction curve, corresp. to the presence of cupric oxide. N_2 formed in the reaction of CuO with hydroxylamine, and the percentage of N_2 is a measure of the amount of transition to CuO.

1752 541.127

The kinetics of the reaction between ascorbic acid and oxygen in the presence of copper ion. SILVERBLATT, E., ROBINSON, A. L., AND KING, C. G. *J. Amer. Chem. Soc.*, 65, *pp.* 137–141, *Feb.*, 1943.—Under conditions such that $k \leq 0{\cdot}12$ min.$^{-1}$ the reaction rate was $\propto$ conc. of cupric ion and ascorbic acid but the k values depended upon the initial conc. of ascorbic acid, H ion and O.

1753 541.127

The rate of conversion of ammonium cyanate to urea in non-aqueous solvents. VI. SVIRBELY, W. J., AND PETERSON, S. *J. Amer. Chem. Soc.*, 65, *pp.* 166–170, *Feb.*, 1943.—A plot of the rate const. corrected to mole fractions against $1/D$ for the non-aq. solvents indicates that sp. solvent effects are more important in accounting for the deviations from linearity than are salting effects.

1754 541.127

The electrostatic influence of substituents on reaction rates. IV. PRICE, D., AND WESTHEIMER, F. H. *J. Chem. Phys.*, 11, *pp.* 150–153, *March*, 1943.—The rates of saponification of ethyl benzoate, ethyl toluate, ethyl anisate, ethyl *p*-chlorobenzoate and ethyl *p*-nitrobenzoate were measured in several alcohol-water mixtures. [See Abstr. 2206 (1939)].

1755 541.127

The resolution and rates of hydrolysis of *d,l*-α-bromopropionic acid and its glycine derivatives. CHADWICK, A. F., AND PACSU, E. *J. Amer. Chem. Soc.*, 65, *pp.* 392–401, *March*, 1943.—The rates of the

emoval of the Br atom in *d,l*-α-bromopropionate, *l*-α-bromopropionylglycinate and *d,l*-α-bromopropionylglycylglycinate ions were measured. The first- nd second-order rate const. were determined at 2 emperatures, and the changes in heat and entropy uring the formation of the activated complex were alculated. From these data the mechanisms of the eactions were postulated.

1756 541.128

The catalytic interchange of groups in aliphatic mines. I. NOZAKI, K. *J. Amer. Chem. Soc.*, 64, *p.* 2920–2923, *Dec.*, 1942.—When aliphatic amines re heated with metal halide catalysts, the groups ttached to the N are redistributed. This redistriution reaction was studied with resp. to the catalytic ctivity of several substances and the order of the eaction with resp. to catalyst conc. The mechanism f the reaction is discussed.

1757 541.128

The catalytic reduction of dehydrocholic acid in resence of Raney nickel. HOEHN, W. M., AND UNGNADE, H. E. *J. Amer. Chem. Soc.*, 65, *p.* 124, *Jan.*, 1943.

1758 541.128

Catalytic decomposition of potassium chlorate. I. KOLHATKAR, G. B., AND SANT, U. A. *J. Univ. Bombay*, 11, *pp.* 96–100, *Nov.*, 1942.—Decomposition of $KClO_3$ heated in the presence of the following oxides is studied: TiO_2, Cr_2O_3, MnO_2, Co_2O_3, Ni_2O_3 and CuO.

1759 541.128

The influence of addenda on the inversion of *l*-menthone with acids in benzene (the effect of solvents in chemical reactions. III). WEISSBERGER, A. *J. Amer. Chem. Soc.*, 65, *pp.* 242–245, *Feb.*, 1943.—The inversion of *l*-menthone with trichloroacetic acid in benzene was studied in the presence of small amounts of various protophilic compounds. The results are compared with those obtained by adding such compounds to solutions of diazoacetic ester or dimethyl yellow and trichloroacetic acid in aprotic solvents. All these addenda retard the rate of reaction. The inversion of *l*-menthone with HCl is retarded by ether and accelerated by phenol.

1760 541.128

The inversion of *l*-menthone and the reaction of diazoacetic ester with the chloroacetic acids. WEISSBERGER, A. *J. Amer. Chem. Soc.*, 65, *pp.* 245–246, *Feb.*, 1943.—The decomposition of diazoacetic ester by the 3 chloroacetic acids in benzene agrees with the Brönsted relation.

1761 541.128

The surface recombination of H atoms and OH radicals. SMITH, W. V. *J. Chem. Phys.*, 11, *pp.* 110–125, *March*, 1943.—A diffusion method of investigating surface recombination of atoms by substances of low catalytic power is presented. The coeff. of recombination for H and OH on pyrex for a temp. range > 500 deg. is evaluated. For smaller ranges of temperature the recombination of H on a number of salts depends on the dryness of the surface. All salts investigated save KCl strongly recombined H when dry. Salts recombining H could not be investigated for OH recombination. KCl, which did not recombine H, did recombine OH strongly. A number of strong dehydrogenating and dehydrating agents were tested for differences in H and OH recombination, but no difference was found.

1762 541.128

The effect of gel water on catalytic activity. III. The decomposition of formic acid over alumina. MUNRO, L. A., DEWAR, D. J., GERTSMAN, S., AND MONTEITH, G. *Canad. J. Res. B*, 21, *pp.* 21–33, *Feb.*, 1943.—The previous observations on the dehydration of ethyl alcohol to ether and ethylene are paralleled by the results with formic acid. There are 2 peaks in the curves showing the rel. betw. activity and gel-water content. The ratio CO/CO_2 changes with gel-water content, i.e. the course of the reaction can be altered by surface modification of the catalyst. The gel showing max. catalytic activity exhibits greatest sorption. X-ray studies of the catalysts show a threefold change in the structure in the 36% to 0% range of water content, but the fibril structure of the gel of max. activity (5·3% water) is the same as that for min. activity.

See Abstr. 1598 541.128 : 535.668 : 532.691

1763 541.128.1

Some boron-trifluoride-catalysed alkylations of halobenzenes. HENNION, G. F., AND PIERONEK, V. R. *J. Amer. Chem. Soc.*, 64, *pp.* 2751–2752, *Dec.*, 1942.—BF_3, with P_2O_5 as an adjunct, is an effective catalyst in the condensation of alcohols with chloro-, bromo- and iodobenzenes. Satisfactory yields of *p-s*-alkylhalobenzenes are readily obtained in this manner.

1764 541.128.1

Mixed heteropoly acid catalysts for the vapour-phase air oxidation of naphthalene. BROWN, H. T., AND FRAZER, J. C. W. *J. Amer. Chem. Soc.*, 64, *pp.* 2917–2920, *Dec.*, 1942.—A series of catalysts was prepared from heteropoly acid crystals containing W and Mo. The activities of these catalysts are studied for the partial oxidation of naphthalene.

1765 541.132

The ionic nature of the Grignard reagent. EVANS, W. V., AND PEARSON, R. *J. Amer. Chem. Soc.*, 64, *pp.* 2865–2871, *Dec.*, 1942.—Transference studies of *n*-butylmagnesium bromide and ethylmagnesium bromide in ether are reported. The conductances of magnesium diethyl and zinc diethyl in ether were measured. A theory is proposed for the ionization of the aliphatic Grignard reagents and for the electrode reactions in their electrolysis. Both the halogen and the alkyl group can ionize. The cation is co-ordinated with ether and is small and slow. The anion is co-ordinated with $RMgX_2$, MgX and R_2Mg and is large and mobile.

1766 541.132

Theory of the iso-electric point. IV. Applications to weak acids and bases and to their intermediate salts: the relative iso-electric point. HILL, T. L. *J. Phys. Chem.*, 47, *pp.* 70–83, *Jan.*, 1943.—Results obtained previously [Abstr. 287 (1943)] apply to weak acids and bases. The treatment is extended to include solutions saturated with resp. to salts of weak acids and bases. The rel. iso-electric pt. is defined and is shown to include the ordinary iso-electric pt. as a special case. All of these types of substances have

the same properties at the rel. i.pt., although the physical significance of corresp. properties varies among different substances.

See Abstr. 1602 541.132 : 532.77

1767 541.132 = 3

State of order in liquid electrolytic solutions. FALKENHAGEN, H. *Phys. Z.*, 43, 11–12, *pp.* 170–190, 1942.—A comprehensive report on electrolyte research in rel. to the interionic theory covering principles of the interionic theory of strong electrolytes, results of the interionic theory and comparison with the experimental finding (thermodynamic reversible and irreversible processes), Arrhenius' theory and interionic theory, and concentrated solutions. Bibliography. H. G. S.

1768 541.133

The ionization constant of morpholine in water. INGRAM, A. R., AND LUDER, W. F. *J. Amer. Chem. Soc.*, 64, *pp.* 3043–3044, *Dec.*, 1942.

1769 541.133 : 545.2

On conductimetric titrations. I. Titration of acids of varying strengths in acetone-water mixtures. II. The analysis of complex mixtures of acids and salts. AIRS, R. S., AND BALFE, M. P. *Trans. Faraday Soc.*, 39, *pp.* 102–114, *April–May*, 1943.

1770 541.134

The electromotive force of the mercurous bromide electrode. CROWELL, W. R., MERTES, R. W., AND BURKE, S. S. *J. Amer. Chem. Soc.*, 64, *pp.* 3021–3023, *Dec.*, 1942.—Determinations of the molal reduction e.m.f. of the HgBr electrode at 25° in 0·1002 *m* HBr solutions show that the values obtained in solutions free from air are about 0·5 mV higher than those in which air is not completely removed.

1771 541.134.5

The oxidation potential of cerous-ceric perchlorates. SHERRILL, M. S., KING, C. B., AND SPOONER, R. C. *J. Amer. Chem. Soc.*, 65, *pp.* 170–179, *Feb.*, 1943.—Measurements were made at 25° of the e.m.f. of cells in which the reaction is $1/2H_2(g) + Ce(ClO_4)_4 = Ce(ClO_4)_3 + HClO_4$. By this means the formal oxidation potential of cerous-ceric perchlorates in solutions of perchloric acid, containing also in 2 cases $NaClO_4$, was determined at acid conc. from 0·2–2·4 wt. formal. This potential varies with the conc. of the H ion from 1·6400–1·7310 V, and is indep. of that of the perchlorate ion.

1772 541.135.5

Change in potential of silver–silver-chloride electrodes with time. SMITH, E. R., AND TAYLOR, J. K. *J. Amer. Chem. Soc.*, 64, *p.* 3053, *Dec.*, 1942.

1773 541.138.2

Studies in electrolytic oxidation. XIII. The electrolytic oxidation of formaldehyde. HICKLING, A., AND RODWELL, F. *J. Chem. Soc.*, *pp.* 90–99, *March*, 1943.—[See Abstr. 1639 (1940)]. The electrolytic oxidation of formaldehyde in acid, neutral and alkaline solutions was investigated at a variety of anodes over a wide range of current densities, and observations of the concomitant potential phenomena were made. Three sets of oxidation products are distinguished, viz. formic acid and H_2, formic acid and H_2O, and CO_2 and H_2O, and the rel. occurrence of the reactions leading to these products depends upon the exp. conditions. The oxidation is a chemical process in which the primary oxidizing agent is H_2O_2 initially formed at the anode, nascent oxygen and oxides formed with the electrode materials playing supplementary parts.

1774 541.14 : 77.012

Latent-image formation. BERG, W. F. *Trans. Faraday Soc.*, 39, *pp.* 115–134, *April–May*, 1943.—A survey article which presents a revised form of the theory of Gurney and Mott [Abstr. 665 (1938)] on the photolysis of AgBr and the photographic latent image. The basic concepts of the theory still hold, but research stimulated by it has necessitated a recasting of some of the details. Fresh exp. results are presented and tentative suggestions are made where there appear to be gaps in the theory or the exp. details. A. H.

1775 541.141.13 : 77.012

Solarization with X-rays and visible light. MAY, A. *J. Opt. Soc. Amer.*, 33, *pp.* 81–88, *Feb.*, 1943.—A study is made of the behaviour of various emulsions towards light and "white" X-rays at and beyond the first decrease in density due to solarization. An attempt is made to estimate the number of X-ray quanta required to produce solarization by means of an investigation of theoretical blackening curves. Only a limited amount of success is obtained in the attempt to fit the observed data experimentally. A. H.

1776 541.144.7 = 3

The photosynthesis of dichloro- and dibromoethane from ethylene and chlorine, and from ethylene and bromine, respectively. SCHMITZ, H., SCHUMACHER, H. J., AND JÄGER, A. *Z. phys. Chem. B*, 51, *pp.* 281–305, *June*, 1942.—The photochemical reactions of C_2H_4 and Cl_2 were investigated betw. 25°–40°C. and those of C_2H_4 and Br_2 betw. 60°–80°C.; equations are given. The vel. of reaction with Br_2 is strongly influenced by pressure. Quantum yields and temp. coeff., and the influence of light intensity, of conc. and of the presence of foreign gases, are determined. The results of the measurements are discussed and compared with previous investigations. R. N.

1777· 541.144.7

Photosynthesis and phosphorylation. RUBEN, S. *J. Amer. Chem. Soc.*, 65, *pp.* 279–282, *Feb.*, 1943.—A new formulation of the mechanism of photosynthesis is presented which offers a model for the fixation and reduction of CO_2, for green plant photosynthesis and for CO_2 fixation and reduction by chemosynthetic and heterotropic organisms.

See Abstr. 1595 541.18.02 : 532.133

See Abstr. 1735 541.18.025 : 539.501

1778 541.18.041

Contributions to the chemistry of indium. VI. The effects of certain hydroxy anions upon the precipitation of hydrous indium hydroxide. MOELLER, T. *J. Phys. Chem.*, 46, *pp.* 794–800, *Oct.*, 1942.—[See Abstr. 587 (1942)]. Indium sulphate solutions treated with equimolar quantities of alkali citrate, tartrate, or malate yield no precip. when titrated with alkali hydroxide, although excessive quantities of the latter may effect precipitation. Alkali lactate does not inhibit hydroxide formation. Electrometric titration

ta indicate the release of hydronium ion to the tent of 1·25, 1·50 and 1·50 moles per mole of In n for citrate, tartrate and malate solutions, respec-ely.

1779 541.18.041 : 541.25

The sedimentation and diffusion behaviour of certain cleic acid preparations. TENNENT, H. G., AND LBRANDT, C. F. *J. Amer. Chem. Soc.*, 65, *pp.* 424–8, *March*, 1943.—Measurements of sedimentation locity, diffusion and apparent sp. vol. were made solutions of 8 nucleic acid preparations. Mol. s., frictional ratios, shape factors and mol. dimen-ns were calculated wherever possible. The cross-ctional diameters of the molecules of the 5 sub-nces for which shape factors can be calculated are entical within the limits of exp. error, regardless of e mol. length.

1780 541.18.046.7

Agar-agar as a coagulant for barium sulphate. GAN, E. J., AND MOYER, H. V. *Industr. Engng hem.* (*Analyt. Edit.*), 14, *pp.* 849–850, *Nov.* 15, 1942.

See Abstr. 1599 541.18.05 : 532.695

1781 541.182.046

Mutual coagulation of colloidal solutions. V. Effect dilution on the mutual coagulation of colloidal solu-ns of ferric hydroxide and thorium hydroxide by prus-n blue. BARVE, P. M., NAIMPALLY, R. B., AND ESAI, B. N. *J. Univ. Bombay*, 11, *pp.* 78–84, *Nov.*, 42.—Mutual coagulation of pos. $Fe(OH)_3$ and $h(OH)_4$ by neg. prussian blue dialysed for different uiv. periods from the point of view of variation of arge on the particles was studied with progressive lution of the colloidal solutions. Although on lution the charge first increases and then decreases r some samples of the sols and continuously de-eases for the others, the width of the zone of mutual agulation decreases continuously. These results e explained on the basis that the effect of increasing e distance betw. the colloidal particles on dilution the width of the zone of mutual coagulation is edominant. [See Abstr. 1102 (1941)].

1782 541.182.5

Gel-formation by mutual interaction of oppositely arged sols. PRASAD, M., AND MEHTA, S. D. *urr. Sci.*, 12, *p.* 19, *Jan.*, 1943.

1783 541.183

Hysteresis in sorption. VII. Scanning of the ysteresis loop. Alumina-gel–water system. VIII. ermanence and scanning of the hysteresis loop. itania-gel–carbon-tetrachloride system. IX. Effect temperature on the hysteresis loop. Silica-gel–ater system. RAO, K. S. *Proc. Indian Acad. Sci. A*, , *pp.* 298–306, *Oct.*, 1942.—[See Abstr. 971 (1941)]. he general characteristics obtained on scanning are conformity with those of other systems and sup-ort the cavity concept.—In a series of sorptions and esorptions of CCl_4 at 30°C. on Ti gel, a permanent ysteresis effect is obtained. The reproducible ysteresis loop has been scanned, the results being in nformity with those of other systems. The hys-resis is caused by cavities in the porous adsorbent. he shape and size of the loop dep. upon the shape d size of the cavities and are indep. of the nature the adsorbate.—Exp. on sorption and desorption of water vapour at 30°, 35° and 40°C. on silica gel have been conducted. The hysteresis effect is exhibited at all temperatures and the loops are identical.

1784 541.183.1

Adsorption of simple and complex cobalt ions on titanium dioxide. NICHOLSON, D. G. *J. Amer. Chem. Soc.*, 64, *pp.* 2820–2821, *Dec.*, 1942.—TiO_2 suspended in water or glacial acetic acid solutions of Co acetate adsorbs Co ions in a rel. short time. Co-ordination of Co ions with ortho-phenanthroline reduces this tendency. Ortho-phenanthroline forms a co-ordination compound with Co acetate in glacial acetic acid.

See Abstr. 1594 541.24 : 532.712 : 532.133

1785 541.24 = 3

On the distribution of mol. wt. occurring with the decomposition of substances with chain molecules. SCHULZ, G. V. *Z. phys. Chem. B*, 51, *pp.* 127–143, *March*, 1942. Erratum, *ibid.*, *p.* 308, *Jnne*, 1942.—Using the method and nomenclature of a previous investigation [Abstr. 266 (1942)] the author calculates the modifications necessary for applying Kuhn's equation for mol. distribution to a slight decomposition of substances with molecules of uniform chain length. The results agree with those of others [Abstr. 2205 (1941)]. Questions of non-uniformity and the determination of viscosimetric average values, the possibility of exp. determination of the distribution by fractionation, and the connection of distribution with reaction-kinetical questions, are discussed. R. N.

1786 541.24 = 3

Note on the gas density of mercury. KLEMM, W., AND KILIAN, H. *Z. phys. Chem. B*, 51, *pp.* 306–307, *June*, 1942.—A supplement to, and correction of, a previous communication [Abstr. 1149 (1942)]. R. N.

See Abstr. 1779 541.25 : 541.18.041

1787 541.265

Parachors and molecular diameters. TELANG, M. S. *Curr. Sci.*, 12, *pp.* 19–20, *Jan.*, 1943.

1788 541.265

Parachors and radii. SUN KUAN-HAN AND SILVERMAN, A. *J. Phys. Chem.*, 47, *pp.* 50–59, *Jan.*, 1943.—Ionic parachor factors should be distinguished from atomic factors derived from non-polar compounds. New ionic parachor factors have been assigned to a number of elements. They agree well with the exp. data. Parachors of soda–silica glasses at 1 000°C. have been estimated.

See Abstr. 1671 541.265 : 532.612 : 536.655

1789 541.452 : 541.571

The hydrogen bond and its influence on acid strength. JENKINS, H. O. *Nature, Lond.*, 151, *pp.* 561–562, *May* 15, 1943.

1790 541.57 = 3

Model considerations on the hydrogen bond. BRIEGLEB, G. *Z. phys. Chem. B*, 51, *pp.* 9–38, *Dec.*, 1941.—HF is the first example of a chain association in the gaseous state. The equilibrium const., the heats of reaction of the single associations and the percentage distribution of the molecules of different association numbers are given as functions of temperature and pressure. As neither quantum-

mechanical resonance nor pure dipole attraction are sufficient for explaining the HF–HF bond, a model consideration is applied for giving an approx. explanation which agrees with the results of measurements of vapour density and of electron diffraction. R. N.

See Abstr. 1789 541.571 : 541.452

1791 541.571.3 = 3

The interaction of loosely bound valency electrons and the cleavage (double-bond) rule. SCHMIDT, O. *Phys. Z.*, 43, 5–6, *pp.* 73–91, 1942.—The considerations on graphite [Abstr. 2153 (1941)] and aromatic substances [Abstr. 2643 (1942)] are extended to unsaturated organic compounds. Their *B*-electrons are regarded as free to a first approx. The effect expressed in the author's cleavage (double-bond) rule [*Zeits. phys. Chem. A*, 159, *p.* 337, 1932] is shown to depend on an interaction of the *B*-electrons. The general validity of the rule is indicated. The discussion covers interaction according to Hückel and Penney, and interaction and distribution of density and energy on the basis of the Pauli principle. Density and zero-point energy values of the *B*-electrons in graphite, benzole and metallic hydrogen are tabulated for comparison. 62 references are given. H. G. S.

1792 541.6

On the theory of the periodic structure of proteins. OGSTON, A. G. *Trans. Faraday Soc.*, 39, *pp.* 151–158, *June*, 1943.—This investigation shows the numerical conditions which must be fulfilled by a regular periodic structure, and leads to a simple diagrammatic method of testing which may be applied even to complex structures, provided that complete analytical data are available. Fulfilment of the conditions shows only that the data are consistent with regularity, which further evidence is needed to prove. There is no suggestion that 2 and 3 hold any unique position as prime factors in the structure of a regular array of the type considered; if the hypotheses of Bergmann and Niemann should be proved to be correct, whether for proteins or for their sub-units, deeper insight into the structure and mode of formation of proteins will be needed to explain them.

1793 541.61

Chemistry of β aryl glutaconic acids. VII. Constitution of the so-called hydroxy-anhydrides. GOGTE, G. R. *Proc. Indian Acad. Sci. A*, 16, *pp.* 240–243, *Oct.*, 1942.

1794 541.623

The ionization constants of aci and nitro forms of some nitroparaffins. TURNBULL, D., AND MARON, S. H. *J. Amer. Chem. Soc.*, 65, *pp.* 212–218, *Feb.*, 1943.—Nitro-ionization const. were determined for nitromethane, nitroethane and nitroisopropane, and aci-ionization const. for nitroethane and nitroisopropane at several temperatures. The nitro-aci tautomeric const. for nitromethane, nitroethane and nitroisopropane are calculated. The effect of substitution on the const. is discussed. Assumption of a common anion for the nitro- and aci-forms leads to inconsistencies in the influence of substitution on the nitro const. and yields an anion with 2 basic strengths.

1795 541.63 : 541.65

The stereochemistry of co-ordination number eight. Optical activity of potassium tetra-oxalato-uranium-IV. MARCHI, L. E., AND MCREYNOLDS, J. P. *J. Amer. Chem. Soc.*, 65, *pp.* 333–335, *March*, 1943.—Optical activity in compounds of elements exhibiting co-ordination nbr. 8 is established by the resolution of $K_4[U(C_2O_4)_4] \cdot 5H_2O$ into 4 isomers: 1 *d* and 1 *l* easily racemized modification and 1 *d* and 1 *l* stable modification by fractional precipitation of the strychnine salt. A partial proof of the structure for compounds of elements exhibiting co-ordination nbr. 8 containing symmetrical bidentate groups is made, inasmuch as any structure not requiring optical isomers for the type of compound studied must be ruled out. The cube and the trigonal prism with 2 extra bonds along the unique axis are ruled out.

1796 541.64

The polymerization of gaseous hydrogen and deuterium fluorides. LONG, R. W., HILDEBRAND, J. H., AND MORRELL, W. E. *J. Amer. Chem. Soc.*, 65, *pp.* 182–187, *Feb.*, 1943.—The association of gaseous HF and DF to form polymers was calculated over a range of temperatures and pressures from the deviations from linearity of the ratio of pressure to abs. temp. at const. vol. The data corresp. to the equations $\log K = 8\,910/T - 43{\cdot}65$ for $(HF)_6$ and to $\log K = 8\,970/T - 43{\cdot}65$ for $(DF)_6$. The corresp. heats of polymerizations are $-40\,800$ and $-41\,100$ cal., respectively.

See Abstr. 1795 541.65 : 541.63

See Abstr. 1644, 1645, 1646 541.651 : 535.343.3

See Abstr. 1669 541.66 : 536.75 : 536.6

1797 541.67 = 3

The dielectric polarization of benzyl alcohol. HÜCKEL, W., AND WENZKE, U. *Z. phys. Chem. B*, 51, *pp.* 144–156, *March*, 1942.—The peculiarities in the rel. betw. dielectric polarization and conc. of alicyclic alcohols [Abstr. 273 (1942)] are further investigated. The polarization was determined for benzyl alcohol dissolved in C_6H_{12}, C_6H_6 and CCl_4 at various temperatures. The polarization/conc. function is different for different temperatures. The type of curve is entirely changed at about 35° with C_6H_6 and betw. 40° and 60° with CCl_4 as solvents. Mol. wts. were determined with C_6H_6 and C_6H_{12} used as solvents. R. N.

1798 542

A review of organic microchemistry. HALLETT, L. T. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 956–990, *Dec.* 15, 1942.

1799 542.48

An efficient column suitable for vacuum fractionation. HALL, S. A., AND PALKIN, S. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 807–811, *Oct.* 15, 1942.

1800 542.69

Constant-level device for hot-water baths. POCOCK, B. W. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 811–812, *Oct.* 15, 1942.

1801 542.8

Simplified cell unit for internal electrolysis. YECK, R. P., AND ZISCHKAU, O. C. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 221–222, *March* 15, 1943.

See Abstr. 1769 545.2 : 541.133

CRYSTALLOGRAPHY.

1802 548 : 53

The structure and properties of diamond. RAMAN, C. V. *Curr. Sci.*, 12, *pp.* 33–42, *Jan.*, 1943.—Various physical properties of diamond, especially those which are different for tetrahedral and octahedral diamond, are explained as arising from the rel. orientations of the atoms, which are assumed to possess tetrahedral symmetry. The phenomena discussed are infra-red absorption, luminescence, X-ray diffraction (including "diffuse" reflection) and photo-conductivity. J. T.

1803 548 : 535.544 : 519.4

Photo-elastic effect in crystals. BHAGAVANTAM, S. *Proc. Indian Acad. Sci. A*, 16, *pp.* 359–365, *Dec.*, 1942.—A method, based on the theory of groups, for obtaining the number of optical, elastic and stress-optical coeff. for each of the 32 classes of crystals is given. The stress-optical coefficients are worked out in detail for all the classes.

See Abstr. 1683 548 : 537.311.33

1804 548.1 : 669.14

The positions of the carbon atoms in martensite. PETCH, N. J. *J. Iron Steel Inst.*, [7 *pp.*], 1943. *Advance copy.*—Indirect evidence of the positions of the C atoms in martensite can be obtained from the change in cell dimensions with C content and from the fact that the structure is tetragonal. The C atoms are at the mid-points of the long edges of the martensite tetragonal cell and at the centres of the faces perpendicular to them. These positions are crystallographically equivalent. The C atoms are surrounded by octahedra of Fe atoms.

See Abstr. 1657 548.55 : 535.43

1805 548.7

Quantitative investigations of amino acids and peptides. XII. ALBRECHT, G., SCHNAKENBERG, G. W., DUNN, M. S., AND MCCULLOUGH, J. D. *J. Phys. Chem.*, 47, *pp.* 24–30, *Jan.*, 1943.—Photomicrographs, densities, axial ratios, space groups, unit cells and number of molecules per unit cell are given for 9 amino acids (5 for the first time).

1806 548.73

A change of symmetry with temperature. PRESTON, G. D., AND TROTTER, J. *Nature, Lond.*, 151, *pp.* 166–167, *Feb.* 6, 1943.

1807 548.73

Dynamics of real crystals. NATH, N. S. N. *Nature, Lond.*, 151, *p.* 196, *Feb.* 13, 1943.

1808 548.73

Density of frequencies in lattice dynamics. BORN, M., LEDERMANN, W. *Nature, Lond.*, 151, *pp.* 197–198, *Feb.* 13, 1943.

1809 548.73

Crystal structure of gadolinium formate, $Gd(OOCH)_3$. PABST, A. *J. Chem. Phys.*, 11, *pp.* 145–149, *March*, 1943.—The crystal structure was studied by Laue, rotation and powder X-ray patterns. It has a rhombohedral lattice. The unit cell, $a_o = 6{\cdot}17$ A, $a = 115° 30'$, contains one molecule, $Gd(OOCH)_3$. Density—(calculated) 3·85, (Berman balance) 3·77. By taking into consideration the symmetry of special positions all space groups except $D_3^7 - R32$ and $C_{3v}^5 - R3m$ can be excluded.

See Abstr. 1736 549.211 : 539.531

GEOPHYSICS

1810 55 : 622.323

Symposium: application of geology and geophysics to war and post-war problems of the petroleum industry. *Geophysics*, 7, *pp.* 268–275, *July*, 1942.—Geophysics on the Pacific Coast, Salvatori, H.; Geophysics in the Permian Basin, Wilson, J. H.; Geophysics in the Mid-Continent, Faust, L. Y.; Geophysics in Canada—Abstract, Freeman, L. I.

1811 550.312

Note on the variation from equator to pole of the earth's gravity. HAMMER, S. *Geophysics*, 8, *pp.* 57–60, *Jan.*, 1943.—The various physical factors constituting the increase in the normal acceleration of gravity of the earth from equator to pole are analysed mathematically. The magnitudes of the essential factors are (1) centripetal acceleration + 3·39 gals, (2) decrease in distance from the centre of the earth—the so-called "Free Air" effect + 6.63 gals and (3) mass-shape effect due to polar flattening − 4·85 gals.

1812 550.341

Reflected refractions. SWARTZ, C. A., AND LINDSEY, R. W. *Geophysics*, 7, *pp.* 78–81, *Jan.*, 1942.—A number of very steep reflections were observed while making a seismograph survey of a salt dome. A time plot of events recorded along a typical profile is shown. The steep reflections came both from the sides of the dome material and from the adjacent upturned sedimentary strata. A reflection from the vertical side of the dome travelling horizontally along a refracted trajectory is discussed in detail.

1813 550.37

A study of electrical earth noise. NEUENSCHWANDER, E. F., AND METCALF, D. F. *Geophysics*, 7, *pp.* 69–77, *Jan.*, 1942.—A comparative method for the investigation of electrical earth noise was developed and is described. Several possible causes which may explain the phenomena observed are discussed. From the similarity found to exist betw. the terrestrial static level and variations in the atmospheric statics it is concluded that both phenomena have predominantly the same origin. The use of earth-noise measurements for the determination of the soil resistivity up to a shallow depth is discussed. R. H. G.

See Abstr. 1679 550.372 : 537.226.2 : 621.396.67 : 621.317.33

See Abstr. 1707 550.384 : 538.71

See Abstr. 1715 550.423 : 539.16.08

1814 550.8

The relative place of empirical and analytic methods of geophysical interpretation. WEAVER, P. *Geophysics*, 7, *pp.* 281–292, *July*, 1942.—After a discussion of the difference betw. empirical and analytic procedure, the author reviews the history of the search for iron ore in the Lake Superior region by magnetic methods.

1815 550.831 : 518.5

A mechanical integrator for the computation of gravity anomalies. SIEGERT, A. J. F. *Geophysics*, 7,

pp. 354–366, *Oct.*, 1942.—With the instrument described, the gravity anomaly caused by an arbitrarily given finite body can be computed. The integrator is operated by tracing the contour lines representing the body in a manner similar to the operation of a planimeter. The design is based on a formula which expresses the gravity anomaly caused by an infinitely thin slab, bounded by a closed curve, as a line integral over this curve.

1816 550.834

An analytical method of making weathering corrections. DOBRIN, M. B. *Geophysics*, 7, *pp.* 393–399, *Oct.*, 1942.—A method of weathering is described by which intercept times can be computed from first-arrival times without plotting time/distance curves. The velocities are determined by a mech. procedure based on least squares.

1817 550.837 : 621.396.1

Note on the transmission of radio waves through the earth. SILVERMAN, D., AND SHEFFET, D. *Geophysics*, 7, *pp.* 406–413, *Oct.*, 1942.—[Abstr. 1543 B (1943)].

1818 550.837.3 : 621.3.011

The impedance of a grounded wire. WOLF, A. *Geophysics*, 7, *pp.* 414–418, *Oct.*, 1942.—[Abstr. 1446 B (1943)].

1819 551.51 : 621.396.91 = 3

On the registration of thunderstorms. LUGEON, J. *Bull. Ass. Suisse Élect.*, 34, *pp.* 29–43, *Jan.* 27, 1943.—[Abstr. 1560 B (1943)].

1820 551.510.41 : 523.4

The geochemistry of the atmosphere and the constitution of the terrestrial planets. WILDT, R. *Rev. Mod. Phys.*, 14, *pp.* 151–159, *April–July*, 1942.—Spectroscopic evidence reg. the composition of the planetary atmospheres is reviewed. The dissimilarities in superficial constitution among the terrestrial planets are attributed to differences in gravitation and surface temperatures, in the rel. sizes of the iron cores, and in the deg. of reduction of the whole system. The period of fractional crystallization of the silicate phase is followed in some detail for the Earth, and the rôles played by free and "fossil" oxygen in the Earth, Mars and Venus are discussed. The replacement of thermochemical by photochemical equilibrium, as the planetary temperature dropped, greatly complicates the atmospheric reactions. The suggestion previously made by the author that the white clouds on Venus consist of solid formaldehyde polymers is now known to be untenable. A. HU.

1821 551.594.6 : 621.396.91

The determination of the location and frequency of thunderstorms by a radio method. FORREST, J. S. *Quart. J. Roy. Met. Soc.*, 69, *pp.* 33–46, *Jan.*, 1943.—A method is described of continuously recording atmospherics in order to obtain warning of the outbreak of a thunderstorm and to determine the distance of the storm from the recording site. The apparatus consists of a receiver tuned to 150 kc./s. and connected to a continuous chart output-recording meter; a modulated oscillator is incorporated in order to maintain const. the characteristics of the receiver. The apparatus is used to provide objective statistical information on the frequency of thunderstorms, and details are given of the diurnal variations in the intensity of atmospherics in the South of England.

VARIOUS SUBJECTS

See Abstr. 1701 552.1 : 538.22

See Abstr. 1604 576.3 : 534.13

See Abstr. 1597 576.72 : 532.63

See Abstr. 1613 577.15.035 : 535.21

1822 591.175.1 : 612.771

Electric fish. COX, R. T. *Amer. J. Phys.*, 11, *pp.* 13–22, *Feb.*, 1943.—This article is largely an historical survey of observations on the shock effects produced by electric fish. The varieties of electric fish are described, particular consideration being given to the electric eel, and the anatomical background of electrical activity is examined. Details are included of recent studies made by the author, which include an oscillographic recording of the discharge produced by the electric eel. A. E. T.

See Abstr. 1822 612.771 : 591.175.1

See Abstr. 1810 622.323 : 55

See Abstr. 1693 633.4 : 537.531.7

1823 666

Refractory materials for glass making. PARTRIDGE, J. H. *G.E.C.J.* [*Gen. Elect. Co.*], 12, *pp.* 119–131, *Feb.*, 1943.

See Abstr. 1804 669.14 : 548.1

See Abstr. 1603 669.24 : 533.15

See Abstr. 1705 669.71 : 537.312.6 : 538.632

1824 677

A textile alternative for sponge-rubber. *J. Sci. Instrum.*, 20, *p.* 80, *May*, 1943.—A description of the properties of Resilitex.

See Abstr. 1723 677 : 539.216.1

See Abstr. 1688 678.02 : 537.363

See Abstr. 1631 678.7 : 535.333-1

See Abstr. 1580 679.5 : 53

See Abstr. 1623 77 : 535.31

See Abstr. 1774 77.012 : 541.14

See Abstr. 1775 77.012 : 541.141.13